

**UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
SHERMAN DIVISION**

Jonathan Corrente, Charles Shaw, and Leo
Williams, each individually and on behalf of
all others similarly situated,

Plaintiffs,

v.

The Charles Schwab Corporation,

Defendant.

Case No. 4:22-cv-470

Jury Trial Demanded

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INTRODUCTION

1. This lawsuit seeks to remedy the damage inflicted by the anticompetitive combination of two of the largest retail brokerages in the United States in October 2020: Charles Schwab and TD Ameritrade. These brokerages cater to retail investors such as Plaintiffs and the Class Members, and while they do not charge commissions, they profit by selling Plaintiffs' and the Class's trades—their order flow—to market makers, who then trade against them for profit.

2. In today's commission-free trading world, retail brokers—who make huge profits selling customers' order flow—compete for retail investors' business by remitting a share of this payment for order flow to customers as part of each trade, through rebates, price improvement, or some combination. However, the Schwab-TD Ameritrade merger, which has created an unprecedented market concentration in which the merged entity has captured and maintained fully half of the retail order flow in the United States, has substantially decreased this competition—if not ended it completely.

3. As a result of the merger's anticompetitive effects, retail customers—including Plaintiffs and the Class Members—have made less money from their trades through rebates or price improvements; have faced increased transaction costs, including through being traded against by market makers using retail customers' own data; have faced even-further-decreased transparency in where their orders are going, what their order flow information is being used for, and how much money is being paid to their brokers for this information's sale; and have even less control and choice regarding how their trades are handled, and on what cost basis.

4. Plaintiffs and the Class Members seek damages and appropriate injunctive relief.

* * *

5. For years, Wall Street was dominated by institutional and other sophisticated investors that had access to the major exchanges and could afford high, and standard, commissions charged by brokers.

6. After mandatory and standard commissions fell away and the markets were deregulated in the late 1970s, a new opportunity arose—to allow individual investors to buy and sell securities. By the early 1980s, Charles Schwab had pioneered a new sort of brokerage, one that catered exclusively to individual investors, with branch offices hundreds and even thousands of miles from Wall Street.

7. The booming stock market of the 1980s brought with it a massive influx of individual investors, often called “retail investors.” These retail investors were making more frequent trades; they were directing their own securities purchases; they were buying mutual funds; and they paid low commissions to discount brokers to make their trades.

8. By the late 1980s, the stock market had crashed, resulting in massive losses, including to individual investors. These losses resulted in a market malaise, especially among retail investors. Even as the stock market began to rise again at the close of the 1980s, retail investors mostly stayed away.

9. New brokerages like Schwab that had catered to retail investors saw a drop-off in demand. This resulted in decreased profits for market makers—firms that executed retail investor orders routed to them by the discount and retail brokerages.

10. In the early 1990s, Bernard Madoff—one of Wall Street’s leading market makers at the time—devised a method that allowed technologically-savvy market makers to profit from retail and individual investor orders even when they were relatively scarce.

11. Madoff’s idea was to pay discount and retail brokers to send their customers’ orders to market makers, who could then trade against those orders for profit. This meant that instead of

routing retail investor orders to the exchanges, retail brokers would route them to market makers that paid for the privilege, but then profited by placing trades against the bid-ask spread.

12. The new practice was called payment for order flow, and it was riddled with inherent conflicts of interest. Brokers, who were fiduciaries of their retail clients, were now being paid to route orders to market makers, who, by definition, profited by trading against those clients.

13. The result was significant backlash, including from Wall Street regulators. To quell the backlash and preserve the practice of payment for order flow, Madoff, his brother, and other market makers—many of whom sat on the rule-making bodies themselves—devised a fig leaf to supposedly reduce the conflict of interest inherent in the practice.

14. That is, Madoff and other market makers proposed a benchmark against which market maker prices would be measured—a National Best Bid Offer price (“NBBO”). This price would be derived mostly from exchange transactions, and if market makers filled orders on terms better than those offered by published NBBO prices, they would be deemed by regulators to have provided “price improvement” to the retail clients of the brokerages that sold them order flow.

15. But the NBBO, which was swiftly adopted by the industry and regulators, had a significant flaw. Payment for order flow arrangements ensured that most retail orders never made it to an exchange. This created a price differential between the market sources for the NBBO price and the prices at which retail investors transacted through the market makers that paid for their orders. The NBBO was “stale,” and market makers could trade in front of it—to retail investors’ detriment.

16. For years, the NBBO price remained the regulatory and industry benchmark for price improvement, but it was an open secret that retail investors were receiving inferior prices, including wider spreads, than on the open exchanges.

17. As trading speeds increased, the NBBO price became increasingly stale. And by the mid 2010s, a new form of arbitrage emerged to profit from the price gap—high frequency trading (“HFT”). HFT firms sprung up rapidly, each seeking to obtain a timing edge.

18. By buying retail order flow, then reaching the exchanges ahead of the order flow, HFTs were able to profit from the latency, while still showing supposed price improvement with respect to the NBBO.

19. Because of the “latency arbitrage” strategy that had emerged, payment for order flow had again become an important part of the market makers’ business model. However, as firms competed away the latency, including by obtaining faster connections to the exchanges, latency diminished, and arbitrage became less profitable.

20. The HFT business collapsed, HFT firms failed, and payment for order flow again became less profitable.

21. By 2016, however, a new form of technology emerged: machine learning and AI systems that could make powerful inferences and predictions directly from data. These systems could, in fact, use deep neural networks—complex mathematical models that, with recent hardware advancements, allowed computers to for the first time in history effectively learn directly from data. This rise of machine learning- and AI-based trading systems again created a massive demand for retail and institutional order flow, this one the most frenzied yet.

22. The new AI and machine learning-based trading systems prioritized data over personnel, and the new Wall Street arms race sought rich, unique, real-time data sources to train and improve firms’ models. For Wall Street quantitative models, however, simple data quality wasn’t enough: the most valuable data imaginable was that of so-called “dumb money”—the actions of retail investors that trading firms’ models could learn to trade *against* for profit. If AI

or machine learning systems could use data to segment retail investors on the wrong side of the market and trade against them, massive profits could be made.

23. This is just what a new generation of market making firms set out to do. Quantitative trading firms such as Citadel, Virtu, Two Sigma, and others rapidly hired AI and machine learning experts to design trading systems for them. At the same time, they quickly expanded their market making businesses, including through aggressive acquisition. The result was a new set of market makers that thrived from retail data, and sought to profit by using this data to aggressively trade against the people who generated it—less sophisticated and less informed retail investors.

24. The most important input to this business model—a more valuable commodity than platinum to a certain type of Wall Street trader—was order flow data from “dumb money,” *i.e.*, retail order flow. The major quantitative market maker firms doubled, quadrupled, and then doubled again the amount of money they paid for retail order flow from the leading retail brokerages, including Schwab and TD Ameritrade.

25. The payments for retail order flow were so large that a new firm, Robinhood Securities, began catering to small, individual investors using a payment for order flow-*only* business model. As such, Robinhood charged no commission to retail investors, and based its entire business model was based on obtaining maximum payments for order flow revenue from market makers, such as Citadel. Robinhood’s financial incentive was to massively increase the number of retail trade orders in any way possible, as market makers purchased trades based on volume, namely on a per-share basis. It did so by, among other things, gamifying retail trades. The only thing that mattered to Robinhood—and to the market makers—was how many “dumb money” trades could be generated, then sold to market makers to be input into their AI models to trade against that same money.

26. The availability of zero-commission trades sent shockwaves across the retail brokerages—who were already increasingly reliant on payment for order flow revenue. By the end of 2019, each of the major players in the market, including TD Ameritrade, E*Trade, Schwab, and others, went all-in on payment for order flow revenue, almost simultaneously eliminating commissions for trades. Trading was now commission-free, and the primary way to make money was to sell retail order flow to market makers.

27. With the abolition of commissions, a new market structure emerged, and with it, a distinct market: the Retail Order Flow Market (ROFM). The principal source of value in this market was the retail investors themselves, who generated the primary commodity—retail order flow. Retail investors produced order flow for retail brokers, which profited by aggregating and selling those orders to dominant quantitative market makers like Citadel and Virtu. In order to induce retail investors to generate the valuable commodity that underpinned this market—retail trades—retail brokers like Schwab and TD Ameritrade competed on “price,” *i.e.*, the share of payment for order flow that would be remitted to retail customers as part of a trade. This remittance could take the form of a rebate, of price improvement, or a combination of both.

28. In short, retail investors, including Plaintiffs and the Class Members, became the sellers in a new market in which the buyers—retail brokers—were already large and relatively few in number. Indeed, as of early 2020, the ROFM was concentrated among a few retail brokers (including Schwab and TD Ameritrade), who in turn worked with a small number of dominant market makers (including Citadel and Virtu). The ROFM had (and has) significant barriers to entry, from technological, to regulatory, to historical.

29. Retail investors produced order flow, retail brokers acquired it from investors for execution services and remittances, and market makers acquired it from brokers for billions of dollars in cash and other inducements. The market makers then fed the retail order flow into AI

and machine learning models designed specifically to trade against the retail investors for profit. There was little price transparency into just how much of the payment for order flow was remitted to retail investors—partly because Madoff-era regulations defined required “price improvement” with respect to the meaninglessly stale NBBO.

30. Two competitive forces, to some extent, reduced the effects of the inherent conflict of interest that resulted from fiduciaries selling their clients’ order flow to firms that would essentially be their counterparties. First, brokers competed with each other for retail investors’ trades—for order flow. Second, market makers competed with each other to purchase order flow from retail brokers. This meant that market makers competed by providing larger payments for order flow, and brokers competed with each other by remitting some share of payment for order flow to retail investors as part of their trades, either through rebates, through price improvements, or through some combination.

31. On October 26, 2020, retail brokerage giants Charles Schwab and TD Ameritrade greatly diminished these competitive forces—indeed, largely eliminated them entirely from the from the RFOM—when the two firms completed a merger, which they had announced at the end of 2019.

32. Together, the combined Schwab-TD Ameritrade entity possessed an unprecedented share of the retail order flow in the United States. That is, the combined brokers together captured *half* of the payments for order flow made in the ROFM, becoming a one-stop shop for market makers seeking to capture large amounts of unsophisticated and less-informed order flow.

33. Market concentration had irreversibly increased.

34. At the same time, consumer choice in the ROFM has greatly declined, transparency has not improved, and the opportunity for collusion on price and terms has measurably heightened,

given the few remaining retail brokerage firms, the large barriers to entry in the ROFM, and a similarly small number of dominant market maker counterparties upstream.

35. Since the Schwab-TD Ameritrade merger, the ROFM has suffered, as competition has substantially lessened. Retail investors—including Plaintiffs and the Class Members—receive even less of the payments their trades generate, whether through rebates or through price improvement; the further aggregation of data has supercharged opaque AI and machine learning models deployed by market makers, obliterating the transparency of retail investors’ transaction costs; and the merger has directly resulted in higher transaction costs for retail investors, including as a result of their being traded against by market makers that bought their order flow from their own brokers.

36. Plaintiffs, on behalf of themselves and a class of equities and equity options investors in the retail order flow market, seek damages, including for the underpayment for their trades by Schwab and TD Ameritrade, as well as injunctive relief that will allow Plaintiffs and the members of the Class to opt out of being herded into the lion’s den by their own brokers.

37. Plaintiffs further seek to prevent future anticompetitive harm in the POFM through an order divesting, or at least segregating, the pre-merger Schwab and TD Ameritrade lines of business.

PARTIES

I. PLAINTIFFS

38. Plaintiff Jonathan Corrente is a citizen of California. Corrente has had an online brokerage account with Schwab since October 2019, and has executed thousands of trades of equities on that account.

39. Plaintiff Charles Shaw is a citizen of New Hampshire. Shaw has had an online brokerage account with Schwab since at least October 2020, and has executed scores of trades on that account, including trades of equities and of exchange traded funds.

40. Plaintiff Leo Williams is a citizen of Florida. Williams has had an online brokerage account with Schwab since June 2020, and has executed scores of trades on that account, including trades of equities and of exchange traded funds.

41. As discussed below, each Plaintiff has been injured and, absent relief from this Court, will continue to be injured as a result of the anticompetitive merger between Schwab and TD Ameritrade.

42. For example, as discussed below, each Plaintiff has received lower payment for order flow remittances—*i.e.*, lower rebates, lower price improvement, or a combination—as part of his trades as a result of the anticompetitive merger of Schwab and TD Ameritrade.

43. Additionally, as discussed below, each Plaintiff has faced decreased consumer choice—including an inability to opt-out of payment for order flow; an inability to direct his trades to an exchange; and an inability to even learn where his order flow is being directed, how it is being used to trade against him, and the off-exchange bid-ask spreads for his orders—as a result of the anticompetitive merger of Schwab and TD Ameritrade.

44. Each Plaintiff faces an imminent risk of continued injury absent intervention by this Court to enjoin or mitigate the effects of the anticompetitive merger, including through divestiture and/or segregation of the pre-merger Schwab and TD Ameritrade lines of business and assets.

45. Each Plaintiff seeks, and is legally entitled to, applicable damages and injunctive relief.

II. DEFENDANT

46. Defendant The Charles Schwab Corporation is a public company incorporated in Delaware and headquartered at 3000 Schwab Way, Westlake, Texas, 76262 within this judicial district.

47. Schwab provides financial services as a securities broker, with 31.9 million active brokerage accounts, 2.1 million corporate retirement plan participants, 1.6 million banking accounts, and approximately \$7.07 trillion in client assets.

48. Schwab (with and/or through its subsidiaries) provides a range of financial services, including wealth management, securities brokerage, banking, asset management, custody, and financial advisory services to individual investors and independent investment advisors.

49. Schwab operates three broker-dealer subsidiaries: Charles Schwab & Co., Inc., TD Ameritrade, Inc., and TD Ameritrade Clearing, Inc.

50. TD Ameritrade, Inc. and TD Ameritrade Clearing, Inc. are affiliated companies and subsidiaries of TD Ameritrade Holding Corporation, which is a wholly-owned subsidiary of Schwab.

51. Schwab also operates a subsidiary that functions as its banking arm, which is a member of the FDIC and an Equal Housing Lender, called Charles Schwab Bank.

JURISDICTION AND VENUE

52. This action arises under Sections 7 and 16 of the Clayton Act (15 U.S.C. §§ 18 and 26). Plaintiffs and the proposed class seek to recover treble damages, interest, costs of suit, equitable relief, and reasonable attorneys' fees for their damages resulting from Defendant's anticompetitive combination and/or merger.

53. This Court has subject matter jurisdiction under 28 U.S.C. §§ 1331 (federal question, 1332 (class action diversity jurisdiction), and 1337(a) (antitrust); and under 15 U.S.C. § 15 (antitrust).

54. Venue is appropriate in this district under 15 U.S.C. § 15(a) (Clayton Act), 15 U.S.C. § 22 (nationwide venue for antitrust matters), and 28 U.S.C. § 1391(b) (general venue provision). Schwab transacts business within this district, and it transacts its affairs and carries out interstate trade and commerce, in substantial part, in this district. Indeed, Schwab is headquartered in this district at 3000 Schwab Way in Westlake, Texas, and carries out significant activities there and elsewhere in the Eastern District of Texas.

55. The Court has personal jurisdiction over Schwab as it is subject to general jurisdiction in the State of Texas, where it maintains its headquarters and its principal place of business. The anticompetitive conduct alleged in this Complaint was targeted at individuals throughout the United States, causing injury to persons in the United States, including in this district.

FACTS

III. THE RISE OF THE INDIVIDUAL INVESTOR AND THE DISCOUNT BROKER

A. The 1980s Bull Run and the Individual Investor

56. United States securities markets have historically been dominated by institutional investors—companies and other entities that manage large aggregations of capital.

57. For example, labor unions representing teachers, firefighters, police officers, government employees, skilled tradespersons, and other workers entrust their pensions and retirement funds to institutions that manage their hard-earned savings on the workers' behalf. The handful of institutions that handled such large-scale investments were, for many decades going back to the pre-Depression era, the principal actors and dominant force in U.S. financial markets.

58. The 1980s, however, permanently changed things. That decade, which was marked by one of the greatest stock market bull runs in U.S. history, sparked the interest of a new class of investor—the individual.

59. As more individuals piled into the stock market in the 1980s, the conventional wisdom that the market was too complex for individuals to navigate began to fade. Moreover, for individuals who wanted to put their money into the surging market, but not necessarily by buying and selling individual stocks, mutual funds became particularly attractive.

60. As the bull market raged in the early 1980s, the sudden influx of individual investors began to transform basic assumptions about the who, what, and why of U.S. financial markets—and what these markets were likely to look like in the future.

61. Even the notoriously staid Securities and Exchange Commission recognized an oncoming sea change. On December 10, 1984, then-SEC Commissioner Charles Cox gave a speech advocating digitization of disclosure documents, which would make them widely available to non-institutional investors.

62. By the mid-1980s, Wall Street analysts and financial journalists began to note the peculiar role that individual investors had begun to play in U.S. markets. Although many factors, including low interest rates and the quelling of inflation fears, contributed to the rapid rise in the stock market, the longevity of the bull run depended on individuals, who did not actively buy and sell against the institutional investors. Rather, they simply held their positions indefinitely, creating a baseline value for many of the most actively traded securities.

63. This new buy-and-hold investor class had for decades been essentially shut out from direct participation in the stock markets. Their arrival *en masse* in the 1980s came alongside another sea change on Wall Street—deregulation.

B. Charles Schwab—the First “Discount” Broker

64. On May 1, 1975, Congress deregulated the stock brokerage industry by stripping the New York Stock Exchange of its power to determine commission rates charged by its members.

65. Deregulation opened the door to discount brokers—firms that took orders to buy and sell securities, but did not offer advice or do research the same way larger, established brokers such as Merrill Lynch did. The birth of the new, discount class of brokers presented an opportunity for individual investors to access the U.S. stock markets.

66. No firm personified the new discount broker than Charles Schwab & Co., Inc., founded by Charles R. Schwab in a two-room office in 1974. After the 1975 deregulation of the New York Stock Exchange, Schwab immediately began catering to individual investors at deeply discounted commissions—far lower than the thousands of dollars in commissions charged for securities transactions by established stock brokerage houses.

67. The old guard fought Schwab aggressively. Schwab’s commissions were less than a third of what the rest of the industry was charging. More to the point, the new discounted-commission business model didn’t merely threaten established Wall Street norms, it opened up an entirely new submarket catering to unsophisticated investors—a submarket increasingly dominated by a firm outside the old guard.

68. At one point, established firms threatened their landlords on Wall Street with lease breakages if those landlords leased property to the new Schwab brokerage.

69. Nonetheless, Schwab doubled down on the individual investor, taking out full page ads featuring its founder’s picture in newspapers throughout the country. Unlike the Wall Street establishment, Schwab opened physical branches across the United States.



Charles R. Schwab, founder of Charles Schwab & Co.

70. The 1980s bull run finally gave Schwab its big break. Individuals poured into the stock market, and Schwab took their orders *en masse*. By 1985, Schwab was the dominant brokerage for individual investors, with ninety offices nationwide.

71. Schwab also provided individual investors with access to information. As its titular founder told the press, “we are open 24 hours a day, seven days a week,” meaning that “a customer can call in, check the portfolio and even place an order, which is filled when the markets open.”

72. By the mid-1980s, Schwab allowed an individual investor to fully immerse him- or herself in Wall Street markets that traded hundreds or even thousands of miles away. For decades, the only way to get real-time market information was to have a man on the inside at the stock exchange. Schwab had automated the process—stock quotes were accessible by phone to Schwab investors, wherever they lived.

73. On March 14, 1985, the New York Times heralded Schwab’s success with individual investors:

As founder and chairman of Charles Schwab & Company, the nation’s largest discount broker, the 47-year-old Mr. Schwab likes to study the habits of investors—900,000 of whom are customers of his fast-growing firm.

“Our customer profile shows that 57 percent have been in the market for 10 years, and 60 percent spend five hours a week on their portfolios,” he said yesterday. “One out of every two persons has two accounts, one with us and another with a full-commission broker. Our average customer does three trades a year.”

A Schwab analysis of the trading of the firm’s equity clients shows that 53 percent of their activity was on the New York Stock Exchange in December 1984. That figure fell to 48 percent in January, when stocks rallied sharply. During this period, the over-the-counter market accounted for 26 percent of their total trading, in both months. Trading on the American Stock Exchange was also consistent: 4 percent for both months. Options trading showed a big gain, rising from 15 percent of the activity in December to 19 percent the next month. “That reflects the huge interest in trading stock-index options, especially Standard & Poor’s 100-stock index option,” Mr. Schwab said.

74. By the mid-1980s, not only was Schwab funneling individual investors into exchange-traded stocks, it was also offering individuals the opportunity to buy and sell stock options. And rather than simply route customer orders to the major exchanges, Schwab also traded for its clients on the over-the-counter markets—where less liquid stocks, including those on the so-called “pink sheets,” were traded.

75. Notably, the over-the-counter markets allowed Schwab to fill orders among a network of brokers, outside of (and without the supervision of) any of the exchanges. By 1985, approximately a quarter of Schwab’s trades for individuals were over the counter—bypassing the exchanges entirely.

76. Schwab also provided individuals with access to a new form of managed fund: mutual funds. As the New York Times reported:

Schwab customers have also stepped up their purchase of mutual funds markedly in recent months. Last year, the firm set up its own “mutual fund marketplace” that permits investors, for a small fee, to buy any of 180 funds—nearly all of the no-load variety—with the convenience of a single telephone call. Within 24 hours, money is invested in whatever fund the investor picks.

The mutual fund service accounted for a net inflow of more than \$300 million in 1984, and nearly one-half of this amount was directed onto Individual Retirement Accounts. In order of preference, Schwab customers put their money into these vehicles: Vanguard Explorer Fund, Fidelity Magellan Fund, Hartwell Leverage Fund, United Serves Gold Shares and Vanguard Windsor Fund. All of these, with the exception of United Services, are mutual funds of the aggressive growth type.

77. By the mid-1980s, mutual funds, over-the-counter trades, and low-commission access to the stock markets generally made Schwab the one-stop shop for the individual investor.

C. The Crash of 1987 and the Individual Investor “Malaise”

78. With the rise of Schwab and an unprecedented bull run, interest from individual investors in the U.S. financial markets had reached a fever pitch in the mid-1980s—that is, until October 1987.

79. On Monday, October 19, 1987—dubbed “Black Monday” by investors and the press—the Dow Jones Industrial Average fell by 508 points, 22.6%, in a single day. After charging ahead for more than five years, the bull had abruptly stopped.

80. Black Monday blindsided, confused, and in many cases financially decimated individual investors in 1987—and it cast a long shadow over individual investment in U.S. markets for years thereafter. Indeed, even as the stock market began to grow again at the end of the 1980s and institution and institutional investors returned in force, individual investors mostly stayed out of the picture.

81. Thus, when in 1989 the Dow Jones Industrial Average soared by about 25 percent—capping off the greatest decade of stock market performance since the 1950s—the Washington Post dubbed this new growth a “joyless prosperity.” The booming 1980s ended not with a bang, but with “malaise,” the Post observed, noting that after Black Monday drove the individual investor out of the markets, most had not returned:

According to the old saw, it is greed and fear that drive stock prices up and down. In recent weeks, however, perhaps the most stunning thing about stock market investing has been the absence of both. There are numerous reasons for this malaise, according to analysts, money managers, brokerage firms, and executives. While many stock prices bounced back this year from the beating they took in the 1987 crash, the small investor has not returned as a direct participant in the market. As a result, most individuals missed out on this year's rally and Wall Street—finding itself with too many brokers and too few customers—has lapsed into a recession, with additional job and salary cuts expected.

82. On June 17, 1990, the New York Times again covered Schwab—this time in connection with the slowing of individual investor interest:

Like most of their more glamorous Wall Street cousins, discount brokers have never fully rebounded from the 1987 stock market crash. They are uniquely dependent on the small investor, who remains stubbornly aloof even as the market reaches new heights. While a few firms continue to profit, the industry is being buffeted by consolidation and change.

By some estimates the number of independent discounters has shrunk by as much as 25 percent since 1983, to about 100. And many of the commercial banks that went into the business expecting to stock another important service in their financial supermarkets have found that discount brokerages add to overhead without yielding much profit.

83. As the 1990s began, downturn in individual demand for U.S. stocks left just three major players that catered to individual investors: Schwab, Fidelity Investments, and Quick & Reilly.

84. The downturn also brought with it “deep” discounters—a fierce new source of price competition. As the New York Times explained in 1990:

Discounters and “deep” discounters are expanding their services, venturing into unfamiliar markets and acquiring competitors to increase their base of customers. They need hordes of customers, since the average discount brokerage account is worth just \$7,000.

85. With demand still flagging and competition fierce, there appeared to be no bottom to commissions for discount brokers at the dawn of the new decade.

86. But as already-low commissions kept dropping, the larger discount brokerage firms, including Schwab—changed with them. Schwab and its principal competitors realized that profits from servicing individual investors would have to come from volume: the success of a discount brokerage depended on herding individual investors through its doors.

87. As a result, Schwab and its “big three” competitors Fidelity and Quick & Reilly began aggressively “acquiring smaller firms whose losses are depleting their scant capital” in the early 1990s. The new game was not directed toward commission levels, but towards aggregating more and more individual investors.

88. However, Schwab and its principal competitors still faced a serious problem that no amount of consolidation could fix: individual investors, though now a significant part of the U.S. markets and there to stay, were for the most part cool on the prospect of putting more money in Wall Street after the Black Monday debacle. And drawing new individual investors was an even tougher proposition.

89. In May 1991, the Associated Press reported that 51 million Americans—twenty-one percent of the total population—now owned either individual stocks or mutual funds. This represented a massive jump from 1980, when only 30 million Americans (13.4 percent of the population) had owned stocks or mutual funds. However, nearly all of the growth in stock ownership had occurred prior to Black Monday—indeed, a 1985 survey showed that 47 million Americans (20.1 percent) owned stocks or mutual funds. In the six years since (which included two additional years of bull market growth before Black Monday), barely any new individual investors had decided to enter the market.

IV. MADOFF AND THE ADVENT OF PAYMENT FOR ORDER FLOW

A. Market Makers – Wall Street’s Middlemen

90. The U.S. financial markets include specific entities that stand ready to both buy and sell a stock or other security on a regular and continuous basis at a publicly quoted price. These entities—which are in practice large, specialized firms—are known as market makers or liquidity providers.

91. Because of the variety of entities (including market makers) who could potentially be in the buy-sell chain for a security, there is an inherent risk of self-dealing and conflicts of interest in U.S. securities markets, where transaction flow can be non-transparent and large firms have related entities at different places in the buy-sell chain. U.S. law imposes on securities brokers a requirement called “best execution,” which requires that brokers provide the most advantageous order execution for their customers given the prevailing market environment. The details of this legal requirement are specified by particular regulators and exchanges, and have varied over time—often at the behest of insiders, as described below.

B. Bernard Madoff Invents Payment for Order Flow

92. As the 1980s ended and the 1990s began, brokers and market makers were faced with a serious problem: flagging retail investment volume had depressed revenue streams for both of them. Market makers, who profited from trading spreads between bid and ask prices, made money from a steady stream of order flow. Brokers—especially retail brokers like Schwab—made money from high trading volume. With the malaise in the market, both brokers and market makers needed a new way to make money.

93. Enter Bernard L. Madoff, a well-respected financier and the head of one of Wall Street’s largest market making firms. Madoff devised a new scheme to increase business: he and

other market makers would pay inducements to brokers and dealers for the order flow of their clients.



94. This meant that when a customer placed an order to buy a security, the order would not go straight to a stock exchange, but would instead be routed through the market maker firms, like Madoff's. Madoff's new practice, "payment for order flow," created a new revenue stream amidst the flagging retail market and quickly became a cash cow for Madoff and his firm, Bernard L. Madoff Investment Securities.

95. By paying for order flow, Madoff and his firm siphoned roughly 10 per cent of the full volume of trading on the New York Stock Exchange away from the specialist firms that dominated the Big Board's floor, creating what was known as a "third market." Madoff made profits by trading within the bid-ask spreads on orders that were directed to his firm.

96. In 1990—as payment for order flow juiced profits at Madoff's firm and began to spread to other market makers—the National Association of Securities Dealers empaneled a group of experts to study the new practice. The committee was headed by former SEC chairman David

Ruder, and notably, the group of experts evaluating the new practice included Madoff himself. In July of 1991, the committee issued a report—the Ruder Report—in which Madoff and his colleagues blessed their new practice.

97. Specifically, the Ruder Report concluded that cash payments for order flow—recently introduced by Madoff, and increasingly adopted by other leading market makers—were not significantly different from other inducements for order flow; recommended that NASD revise its Best Execution interpretation to presume that best execution will be obtained by executions at the “best bid or offer” for small orders; and recommended that the NASD revise its rule proposal to require disclosure of all inducements for order flow.

98. Having cleared this initial inquiry (albeit from inside the room), Madoff’s new moneymaking scheme still faced two related hurdles.

99. First, brokers-dealers owed duties to their customers. In particular, broker-dealers had a duty to give their customers so-called “best execution” of their orders, which in most cases meant that they could not give their customers prices inferior to what was available in the market.

100. Second, for payment for order flow to be profitable, Madoff and other market makers had to ensure that the price they offered *looked* competitive, but was actually not. The math behind this was simple—if Madoff and other market makers were going to pay money for order flow and still turn a profit, they needed to be able to profitably trade for their own account against customers. To do this, market makers needed to be able to offer worse-than-market prices to small investors.

101. In short, in order for Madoff and other market makers to profit from payment for order flow, they needed to convince NASD and other regulators to broaden their definitions of what it meant to give customers “best execution.” In a happy coincidence, Madoff had served as vice chairman, board of governors member, and regional chair of the NASD, the principal

regulator that needed to be lobbied; Madoff had also served as chairman of the NASDAQ exchange. He was just the man to do the needed lobbying.

102. In response to relentless campaigning by Madoff and other market makers, NASD and other regulators buckled. They broadened the notion of “best execution” to include non-price factors, such as order size, the particular security involved, the speed of execution, access to market centers, and the availability of technology aids. In other words, after Madoff and other market makers were through lobbying the regulators, “best execution” could be achieved at an inferior price.

103. Having convinced regulators to change the rules so that market makers could satisfy “best execution” without competitive prices, Madoff and other payment for order flow progenitors pushed even further. For example, Madoff recognized that one way to insulate payment for order flow from various regulations and legal duties was to define a tolerable price hurdle that market makers could clear as a fig leaf—a specified price point that insiders could *call* competitive, but that really wasn’t. To do this, many broker-dealers adopted the practice of guaranteeing execution at the “best bid or offer” available on exchanges. That is, a broker-dealer would use an identified exchange price for an off-exchange transaction, and everyone involved would agree that this price was “competitive” for the broker-dealer’s customer.

104. The reality was somewhat different. Spreads against exchange prices were quite large and slow to adjust, and this left plenty of room for Madoff and other market makers to make substantial profits.

105. The key for Madoff and other market makers was to ensure that the customers behind the order flow they paid for were not sophisticated, such that they were unlikely to trade in the right direction. This meant that when the market moved, it made Madoff and other market makers’ trades against the order flow more profitable, creating a margin for error.

106. Madoff orchestrated outright collusion on this point. As Fortune magazine recounted in a 2008 article:

Bernie led a group of Nasdaq marketmakers who wanted a piece of the NYSE's very profitable game. They argued they could give investors a better deal by bypassing the established exchanges and matching buyers and sellers more rapidly on their own computers. There was only one problem: The marketmakers were gaming the system, too. Madoff paid brokers to steer orders to his computers—as long as they were from relatively ignorant retail customers who didn't possess information that could move the market away from him too quickly. The marketmakers also kept spreads at 25 cents or more by refusing to post offer prices in "odd eighths," or 12.5 cents off the bid, and refusing to deal with anybody who broke rank.

107. Madoff and the market makers understood the linchpin of their scheme well—they would have to move lockstep. If any market maker undercut the wide spreads, order flow inducements would not be nearly as profitable. In other words, payment for order flow required both a steady flow of unsophisticated investor trades, *and a chokepoint for market makers*, so that they could profit by trading within significantly wider spreads.

C. Spread Manipulation Revealed

108. In 1994, a study by two professors, William Christie and Paul Schultz, was published in *The Journal of Finance*.

109. Christie and Schultz had found that Nasdaq dealers were commonly avoiding odd-eighth quotes—quotes with prices such as 5 3/8, with odd fractional numerators. The professors concluded that this evidenced implicit collusion among Nasdaq dealers to maintain artificially wide bid-ask spreads.

110. The study's findings stunned the financial markets, and price spreads collapsed after its publication.

111. The Christie-Schultz study spurred investigations by the Department of Justice and the Securities and Exchange Commission. It also resulted in a class action lawsuit, which was ultimately settled in November 1998 for an aggregate amount of approximately \$1 billion.

112. The immediate regulatory aftermath of the Christie-Schultz study focused on broker-dealers: the Department of Justice discouraged communications among broker-dealers, and broker-dealer conversations would thereafter be taped.

113. However, the driving force behind the naked collusion found by Christie and Schultz was not broker-dealers themselves, but the machinations of market makers like Madoff: spreads had been artificially widened through outright collusion in order to enrich a small handful of market makers who would benefit from the practice.

D. Payment for Order Flow Infects Retail Options Trades

114. Investigations continued in the wake of the Christie-Schultz study and its regulatory aftermath—and eventually broadened to examine payment for order flow.

115. By August 2000, the Department of Justice had begun investigating payment for order flow in the options market.

116. In December 2000, the SEC released a Special Study titled Payment for Order Flow and Internalization in the Options Markets. The study recounted a growing trend: options orders were being “internalized,” meaning they would be fulfilled without ever reaching exchanges. And market makers were paying brokers for valuable order flow of such options:

With increased competition for options order flow, options market participants—like participants in the equities markets—have begun to offer direct and indirect economic inducements to brokers in return for brokers agreeing to route their customers’ order flow to them. These economic inducements principally take the form of direct cash payments to order routing firms (“payment for order flow”). In addition, other inducements also have arisen in the options markets, such as “internalization” of retail options orders, i.e., firms trading as counter-parties with their customer orders, or

firms routing to affiliated specialists, and reciprocal order routing agreements. In July 2000, the options exchanges began facilitating their members' payment for order flow strategies by instituting programs to collect transaction fees from specialists and market makers and to make these funds available to specialists to pay for order flow sent to the exchange.

117. Internalization allowed market makers to "capture" orders before they made it to the open markets, where prices are transparent. This meant that if a market maker could fulfill an order with another captured order, it could keep the price difference without moving public prices.

118. For options, the spreads were significantly wider than for equities, making internalization profitable, but only if enough order flow existed. That is why payment for order flow made economic sense: the profit margins from internalization were so high that it was worth paying to herd customer orders into the market makers' black box. As the SEC explained in its 2000 report:

Payment for order flow is a method of transferring some of the trading profits from market making to the brokers that route customer orders to specialists for execution. Internalization allows a firm to capture trading profits from trading against the firm's own customers' orders. However, payment for order flow and internalization create conflicts of interest for brokers because of the tension between the firms' interests in maximizing payment for order flow or trading profits generated from internalizing their customers' orders, and their fiduciary obligation to route their customers' orders to the best markets. The revenue generated from payment for order flow and internalization have the potential, as seen in the equity markets, to be partly passed on to investors in the form of reduced costs. To date, however, few firms are passing along the benefits of payment for options order flow to their customers in the form of either reduced commissions or rebates.

119. As the SEC explained, the practice of internalization and payment for order flow created a significant conflict of interest for the brokers, who were essentially being paid to herd their customers into black-box order fulfillment by market makers, and who would profit from price differences in the order flow they received.

120. The SEC expressed concern that the practice was creating significant inefficiency in the markets:

Further, the Commission recently expressed its concern that payment for order flow and internalization contribute to an environment in which quote competition is not always rewarded, thereby discouraging the display of aggressively priced quotes. In the multiple trading environment, specialists on the competing options exchanges typically will promise to match the displayed prices of other exchanges. If widespread, these passive “price matching” practices may weaken the incentive to display competitive quotes, because displaying a superior quote does not necessarily ensure attracting additional order flow. Over time, therefore, the quotes being matched may become wider, increasing execution costs to investors. By some measures, the improvements in quoted prices experienced after increased multiple-listing in August 1999 have been muted coincident with the increasing prevalence of payment for order flow and internalization.

121. The SEC seized on the mechanism for price inefficiency. Because market makers would capture order flow, that order flow would never make it to open markets, meaning that even if specialists on an exchange lowered their prices, they would not necessarily attract more orders. This was because those orders would be fulfilled through internalization before they ever made it to the market, in turn, disincentivizing exchange participants from offering better prices.

122. In other words, payment for order flow and internalization went hand in hand, and allowed market makers to extract large profits from orders herded to them from brokers. The orders would never make it to the exchanges, so prices would not reflect the internalized trades, and, because the brokers were being paid to route to the market makers, the market makers controlled the order flow.

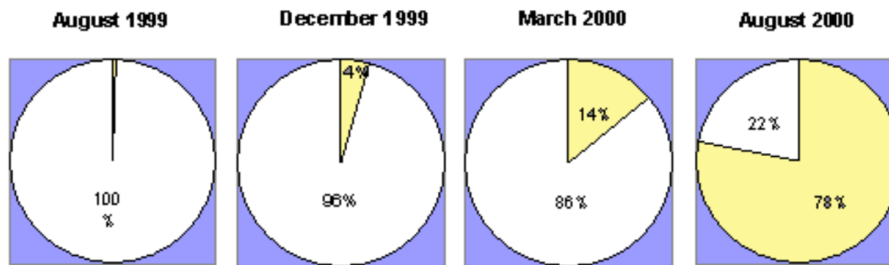
123. The SEC, after studying order routing, found that there was a sudden rise in orders by retail investors that were subject to payment for order flow:

The Staff found that the number of retail customer options orders paid for pursuant to payment for order flow arrangements has steadily increased. As illustrated in the following charts, in August

2000, specialists paid order routing firms for over 75% of the retail options orders sent to them for execution.

124. The SEC's study showed a massive spike in payment for options order flow at the turn of the millennium.

Percentage of Retail Customers' Orders Routed Pursuant to Payment Arrangements (53 Options Classes)



125. The SEC observed that 19 of the 24 broker-dealers it examined accepted payment for order flow. Only four had policies not to accept payment for order flow.

126. Almost none of the broker-dealers that did accept payment for order flow, however, passed on their windfall to their customers:

As of November 30, 2000, these firms have not passed along to retail customers the benefits of payments received for order flow in the form of reduced retail commissions or direct rebates. In fact, only one firm has significantly reduced retail customer commissions for executing listed options orders, and another firm maintains a policy to rebate payments received for order flow to customers.

127. Remarkably, only one firm provided its customers with rebates reflecting the amounts paid for their order flow. The rest did not.

128. A comparison of firms that accepted payment for order flow versus those that did not yielded something notable—the two groups of firms differed 180 degrees on which market makers were in fact best suited to fulfill their customers' orders:

The Staff found that order routing firms that maintained policies not to accept payment for order flow almost never determined that market centers that paid for order flow were the highest quality

markets. Conversely, order routing firms with policies to accept payment for order flow contended to Staff that their market quality evaluations often demonstrated that market centers that paid for order flow were the highest quality markets.

129. That is, brokers that did not accept payment for order flow “almost never determined” that PFOF market makers like Madoff were the best markets for their customers. Brokers that were paid for order flow frequently found that PFOF market makers like Madoff were the best markets for their customers.

130. The SEC further found that payment for order flow directly impacted routing decisions:

- Payment for order flow has had an impact on order routing decisions. In the options classes reviewed by the Staff, the firms that maintained policies to accept payment for order flow re-routed their customers’ order to specialists that pay for order flow (and away from specialists that did not) much more often than did firms that maintain policies not to accept payment for order flow.
- While some firms that accepted payment for order flow acknowledged that such payments influenced their order routing decisions, most firms denied that it had any influence on their order routing decisions. The Staff found that most of the firms that accept payment for order flow re-routed some of their customers’ options orders to specialists that agreed to pay for order flow and away from specialists that did not pay. In fact, the Staff found that four of the 19 firms reviewed that accept payment for order flow re-routed 75% or more of their customers’ options orders in at least 8 of the 12 classes reviewed by the Staff to specialists that paid them for order flow. Four other firms similarly re-routed 25% or more of their customers’ options orders in at least 8 of the 12 classes to specialists that paid them for order flow.

131. Put simply, there was an unmistakable effect—when brokers were paid to route their customers to certain market makers, they unsurprisingly routed them to those market makers. The SEC found that the opposite was true as well:

Order routing firms that do not accept payment for order flow generally routed their customer orders to the exchange that had the largest market share in a particular options class. Overall, in the options classes reviewed by the Staff, the firms that maintained policies not to accept payment for order flow re-routed significantly fewer options classes to specialists that pay for order flow than did firms that maintain policies to accept payment for order flow.

132. The SEC reached several conclusions about the practice. First, the SEC found that “Broker-dealers do not have adequate market execution quality information to reliably compare the quality of executions between specialist firms.” This meant that there was no clear way for brokers to substantiate their claims about order quality with respect to specialists who paid them for order flow.

133. The SEC further noted that a national best bid or offer (“NBBO”) price would “facilitate the creation of uniform measures of execution quality.” The SEC also took solace in the fact that the practice of “internalization of retail customer options orders” had not yet become a “prevalent practice in the options industry.”

134. Many of these observations and assumptions would prove deeply flawed.

V. THE RISE OF EXECUTION QUALITY ARBITRAGE AND QUANTITATIVE MARKET-MAKING BY HIGH FREQUENCY TRADERS

A. The NBBO Price: A Cover for Massive Market-Maker Profits from Poor Execution Quality

135. In August 2005, the SEC amended and consolidated its order execution rules into a new set of regulations, promulgated as Regulation NMS. Regulation NMS included a new measurement called the National Best Bid and Offer (“NBBO”) price.

136. The NBBO price would, in theory, serve as an aggregation of prices available in various market centers at a given time. Per Regulation NMS, the NBBO for a stock is defined as the best bid and best offer for that stock sent by a market center to a “plan processor,” which would calculate and disseminate the NBBO on a current and continuing basis. “Plan processor,” in turn,

could be a “securities information processor” (SIP) (which is intended to provide an NBBO consistent across exchanges) or a self-regulatory organization like an exchange (which could lead to NBBO arbitrage between and among the exchanges, particularly if the SIP price is stale).

137. Over time, tech-savvy market participants increasingly used the latter to trade against the former, using NBBO prices directly computed by respective exchanges—prices which could necessarily vary from one another over very small periods of time—to trade against other exchanges and/or a stale SIP quote. As trading times outpaced exchange latency, it became increasingly likely that different exchanges would reflect different NBBO prices at the exact moment a trade was to be executed—and that market makers would know about it. At the same time, if the SIP price was stale (which it frequently would be), those market makers could use their direct exchange feeds to trade against *that*.

138. This was by design (or at least by intent) of sophisticated market participants who rely on spread arbitrage to make money trading against retail investors—principally market makers who pay for order flow, trade at infinitesimally small intervals, and profit from inflated bid-ask spreads.

139. In other words, in modern practice, the NBBO price seldom reflects the actual best price. In fact, the NBBO price is often extremely out of sync with the actual best bids and offers available to sophisticated investors. As one 2014 report by a data aggregator found, the prevailing NBBO price was in some instances several minutes stale. This has become extremely problematic as trading times are increasingly on the order of fractions of a second.

140. As time wore on, the regulation designed to ensure that broker-dealers provide (and receive) the best price for their retail customers increasingly created a massive latency—an inefficiency that could be systematically exploited by market makers.

141. This latency created a problem that exacerbated the already-problematic conflict of interest at the heart of payment for order flow. If the NBBO price does not ensure that the broker routes a trade to a wholesaler with the best price, then there is no way to truly determine whether the customer is in fact being provided the best possible trade execution or price. Given technological changes in the early 2010s, this was increasingly weaponized by technologically sophisticated market makers.

142. As an industry insider explained in March 2015, payment for order flow means that the market maker paying the “kick back” or rebate must find some way to turn a profit:

When executing a trade in the US equity market, retail investors are typically limited to where they can direct their orders for execution. As a result, most retail investors orders are directed by the retail brokerage firm to one of several Wholesalers (aka, market makers of internalizers) with which the firm has a “Payment for Order Flow” (PFOF) relationship, a financial industry phrase used to describe a legal form of “kick back[.]” . . .

Stated another way, after accepting an order from the Retail Broker, a Wholesaler needs to find a way to pay for the kick back to the Retail Broker, provide the retail investor some “price improvement” (according to its industry definition) and, of course, generate a profit for itself.

143. The wholesaler or market maker achieves a profit by taking advantage of internalization. If orders are routed to the market maker, the market maker can take advantage of spreads between orders routed to it. The problem is that the market maker must match these prices while still showing “price improvement” for the broker that routed the trade.

144. This is where the NBBO’s stale prices provide cover for both the broker and the market maker. As the industry insider explained, the market maker can profit if it knows that the price has changed and that the NBBO is stale:

In the case of a Market Order, an order to immediately buy or sell a stock at the best available price, a Wholesaler may decide to trade against a retail order if they can offset a position already in inventory

or if they can immediately profit by trading against the retail customer using a stale price on the SIP (Securities Information Processor, a.k.a. [*sic*] the consolidated feed) at a time when the Wholesaler knows that the actual market price has already changed, according to its faster direct market data feeds.

It is important to recognize that the price assigned to a retail trade by the Wholesaler is arbitrary—it can be any price at or between the NBBO (National Best Bid/Offer) displayed by the SIP during a 1 second interval.

145. In other words, if the market maker knows the NBBO is stale, it can make a hefty profit by internalizing orders before the price is updated. The same NANEX report provided an example:

For example: a retail Market order to buy 1000 shares arrives when the SIP shows the stock is trading at \$9.99 bid, \$10.00 offered (9.99 x 10.00). The Wholesaler might decide to sell to the retail investor if he knows, according to his own faster version of market data, that the market for the stock is actually, or will soon be, trading lower at 9.98 x 9.99.

In that case, the Wholesaler might execute a short sell against the retail customer at a price of \$9.9999, providing the customer with \$0.0001 price improvement (relative to a stale SIP price of \$10.00) on all 1000 shares. The Wholesaler can then immediately cover his short by buying the 1000 shares in the open market at \$9.99.

To the Retail Broker, it will appear that the investor received a total price improvement of \$0.10 on a 1000 share order (\$0.0001 x 1000).

For the Wholesaler, after paying the Retail Broker \$2.00 to execute the order based on a hypothetical \$0.0020 per share PFOF arrangement, and paying maximum execution fees of no more than \$0.0030 per share to cover the short by buying shares in the open market, the Wholesaler made a \$4.90 profit on the trade, in a stock with a penny spread. Note that stocks with wider spreads increase the potential profit to the Wholesaler without any assurance of an increase in the amount of price improvement provided to the retail investor.

146. In this example, the supposed “price improvement” is in fact illusory. It only exists because of the stale, regulatorily imposed NBBO price. In fact, the entire regulatory scheme gives

rise to an edge for a market maker who can capture large amounts of order flow and that has insight into market direction ahead of the NBBO prices.

B. The High Frequency Trading Arms Race

147. The cohort of market makers that emerged to take advantage of the latency created by the NBBO price and the regulatory scheme were high-frequency traders (“HFTs”).

148. These traders profited by obtaining order flow and trading ahead of it either through internalization or by reaching the exchanges first.

149. For market makers that could obtain a tiny edge on execution speeds, payment for order flow was worth the price. The order flow received could be systematically front-run, meaning the wholesaler could sell a stock to fill an order and buy it at a cheaper price elsewhere or vice versa, capturing the spread.

150. The key to this game became identifying latency in brokerage execution times. HFTs would create “latency tables,” then identify patterns in trades that came from various retail brokers.

151. By 2010, companies were clamoring to obtain microsecond-level improvements in transmission time, allowing them to intercept paid-for order flow and to trade ahead of it.

152. As the Guardian reported in 2014, actionable latency in prices coupled with payment for order flow created an arms race:

To win Wall Street’s new arms race for speed, high-frequency traders employ various methods: some firms use co-location, placing their computers as close an exchange’s servers as possible. Others rely on dedicated communication lines from companies like Spread Networks. Still more firms pay for direct feeds from exchanges—and they pay a lot: approximately \$1.5bn was spent in 2013 on overall technology to reduce latency, according to estimates by the Tabb Group.

153. HFT-based market makers were also rapidly collecting rebates—or payments—from liquidity providers. And they were exploiting their speed with phantom or flash orders—rapid microsecond-long orders that are meant to move, deceive, or misdirect the market into thinking that a large order has appeared at a new price point.

154. With respect to most of these strategies, speed was the differentiator, but more importantly, it was the most obvious way to gain insight as to which direction the market was about to move. Knowing the direction of the market meant knowing precisely how stale the NBBO price was. Speed meant beating orders to the market, and it also meant the ability to pretend that the customer, whose order was herded to the market maker for a kickback, was better off for it all.

155. Citadel, one of the largest market makers, sought to exploit its speed advantage by capturing order flow from broker-dealers. In late 2007, as a real estate and mortgage-backed securities downturn began to infect markets worldwide, broker-dealer E*Trade found itself in dire straits, with failing mortgage products on its books.

156. Citadel offered a bailout. In exchange, Citadel demanded the order flow from E*Trade's clients. As MarketWatch reported on December 4, 2007:

The deal under which E*Trade Financial Corp. (ETFC) accepted a \$2.55 billion cash infusion from hedge fund Citadel Investment Group also included an agreement to route all its customer options and a significant portion of stock order flow through Citadel for the next three years.

The company's 8-K filing to the Securities and Exchange Commission revealed that E*Trade Securities LLC has committed to route "substantially all of its customer orders in exchange-listed options" and 40% of orders for exchange-listed stocks to Citadel Derivatives Group LLC, for handling and execution, for three years.

157. Citadel had, in exchange for a \$2.55 billion bailout to E*Trade, received something far more valuable—a steady stream of unsophisticated order flow. As explained below, Citadel relentlessly exploited this order flow, resulting in an investigation and fine by the SEC.

158. Citadel continued to capture order flow from other retail brokers, including Charles Schwab, Ameritrade, and Scottrade Financial Services. Citadel had a speed advantage, and it was worth buying up order flow in order to exploit that advantage.

159. From at least the end of 2007 through 2010, Citadel had captured approximately a third of all retail order flow. Other market makers had followed suit during this period, pairing their HFT operations with large-scale market-making designed to exploit unsophisticated retail investors. The practice continued to grow among market makers through 2012 and 2013.

160. In May 2013, Berkshire Hathaway's famed Charlie Munger spoke out against the practice:

I think it is very stupid to allow a system to evolve where half the trading is a bunch of short-term people trying to get information one-millionth of a nano-second ahead of somebody else. It's legalized front-running; I think it's basically evil and it should never have been able to reach the size that it did . . . why should all of us pay a little group of people to engage in legalized front-running of our orders?

161. The full story, including the race for latency arbitrage, was laid out for the first time by writer Michael Lewis, in the book *Flash Boys*, which was published in March 2014. The book caused immediate uproar, with repeated calls to fix and regulate the "rigged" stock market.



162. In a March 31, 2014 interview with CBS's *60 Minutes*, Lewis explained:

Lewis: The insiders are able to move faster than you. They're able to see your order and play it against other orders in ways that you don't understand. They're able to front run your order.

Interviewer: What do you mean front run?

Lewis: It means they're able to identify your desire to buy shares in Microsoft. And buy them in front of you and sell them back to you at a higher price. It all happens in infinitesimally small periods of time. The speed advantage that faster traders have is milliseconds. Some of them fractions of milliseconds, but it is enough for them to identify what you're going to do and do it before you do it at your expense.

Interviewer: So it drives the price up.

Lewis: It drives the price up and in turn you pay a higher price.

163. Put simply, the execution time advantage meant that a market maker could determine what a relevant price would be in the immediate future. The easiest way to make money of these informational edge was to intercept order flow from retail investors and then trade against them based on that information.

164. However, while this was the most obvious way to leverage order flow information, it would not last.

C. The Regulatory Backlash

165. After Lewis put HFTs' most egregious practices on the NY Times Bestseller list and on *60 Minutes*, regulators began a crackdown. For example, On January 12, 2015, the SEC announced a \$14 million penalty against a subsidiary of BATS Global Markets, an exchange operator founded by high-frequency traders.

166. Also in January 2015, UBS agreed to pay \$14.4 million to settle charges of not disclosing an order type that allowed high-frequency traders to jump ahead of other participants.

167. Citadel, for its part, had exploited the latency between delayed NBBO and SIP to trade against consumers whose order flow it had purchased from E*Trade and others. Ironically, had actually weaponized consumers' supposed protection against payment for order flow conflicts of interest—the NBBO price—exploit their trades for profit.

168. Citadel had deployed at least two algorithms designed to use “latency arbitrage” to profit from the NBBO price. The SEC summarized two Citadel strategies the agency had investigated in a January 13, 2017, Cease and Desist Order:

9. During the relevant period, two of the algorithmic strategies [Citadel Execution Services] used to handle marketable orders were triggered when differences existed between SIP NBB or NBO, as applicable, and the best prices (*i.e.*, best bid or best offer, as applicable) from one or more depth of book feeds.

10. One strategy, known as FastFill, was triggered when the best price from one or more of the depth of book feeds that FastFill referenced was better than the best price disseminated by the SIP feed. Assuming all other eligibility conditions were met, FastFill immediately internalized a marketable order at the SIP NBB or NBO, as applicable or better.

11. For example, if [Citadel Execution Services] was handling a marketable order to buy shares, and the SIP best offer was \$10.01, and the best offer from one or more of the depth of book feeds was \$10.00, FastFill immediately internalized the order using the SIP offer of \$10.01 per share. FastFill did not internalize at or seek to obtain through routing the better \$10.00 price from the depth of book feeds.

12. The second strategy, known as SmartProvide, was triggered when the SIP NBB or NBO, as applicable, was better than the best price from at least one of the depth of book feeds. SmartProvide did not internalize at the SIP price, nor did it seek to obtain an execution at that price by sending an order to the market. Instead, assuming all other conditions for order handling by SmartProvide were met, SmartProvide would route a non-marketable order to the market.

13. For example, if [Citadel Execution Services] was handling a marketable order to buy shares, and the SIP NBO was \$10.01, and the best offer from one or more of the depth of book feeds was \$10.02, SmartProvide would send a buy order to be displayed in the market at a price less than \$10.01, such as \$10.00. This order would

be displayed for up to one to five seconds, depending on the size of the order. If this order received an execution, the customer order would benefit from the execution at the better price (*i.e.*, the shares purchased by the customer would be at a price at least one penny better than the NBO). This occurred for approximately 18% of the shares handled by SmartProvide. If the order did not receive a full execution from this routing, [Citadel Execution Services]’s algorithms reassessed the handling of the remaining shares, and could either internalize or seek to obtain an execution in the market. Some of the orders that [Citadel Execution Services] internalized after SmartProvide displayed an order in the market on their behalf received a price that was worse than they otherwise would have received in the absence of SmartProvide.

169. Citadel had designed high-frequency, automated strategies to exploit the very protections put in place for investors with respect to inherent conflicts of interest arising from payment for order flow. The broker-dealers, including Schwab, did nothing to protect their customers. Instead, they accepted their payments—a kickback—to send their clients into the lion’s den, where Citadel would trade against them. Yet when confronted with the realities of what market makers were doing to their clients, broker-dealers fell back on the same refrain—clients were getting “price improvement,” particularly with respect to the NBBO price.

170. The SEC for its part, failed to meaningfully punish the conduct. For example, the agency fined Citadel a paltry \$22 million—a sum far less than the amount Citadel made from exploiting payment for order flow. To Citadel—and in fact to any rational actor—the SEC fine was nothing more than a small tax that was well worth its billions of dollars in profits. Moreover, the SEC justified its small fine by couching its Cease and Desist as geared towards Citadel’s insufficient disclosures, not toward the front-running-like practices Citadel employed in themselves.

D. The HFT Collapse

171. By March 2017, the Wall Street Journal had declared an end to the arms race among HFT firms:

The flash boys aren't as flashy as they used to be.

High-speed trading gained notoriety after Michael Lewis's 2014 book "Flash Boys." These days, the industry is struggling with another problem: It is having trouble making money. . . .

Revenues at HFT firms from U.S. equities trading were an estimated \$1.1 billion last year, down from \$7.2 billion in 2009, according to research firm Tabb Group.

172. The cost of the arms race had taken its toll:

It is an expensive arms race. When many high-speed traders got their start in the 2000s, the leading technology for transmitting data was fiber-optic cable.

But starting in 2010, the speediest firms began to use microwave networks, shaving milliseconds off the time it takes to transmit information on routes such as the Chicago-New York corridor. Upgrading to microwave networks—and later millimeter-wave and laser technology—added to the costs, traders say. All this hurt HFT firms' bottom lines just as slumping volatility was eroding their top-line revenues.

173. In addition, HFTs required actionable, real-time data, and the exchanges had significantly increased prices for such data. Without robust real-time data, HFT firms could not find price latencies to exploit—certainly not fast enough to justify the cost of buying order flow from retail brokers.

174. As the margins closed, HFTs could only afford smaller inducements to retail brokers, putting pressure on the overall practice of PFOF as a profitable enterprise. The core of the problem was that the very premise of the strategy employed by HFTs was based on a market edge that had eroded. Speed was no longer a significant advantage. Its value had shrunk. Moreover, regulators and the public had become aware of the overt front-running nature of the strategies used by HFT firms.

175. Indeed, as a March 21, 2017, article in the Wall Street Journal explained, the flaws that allowed exploitation of retail investors had eroded:

Some industry veterans also say the profits have suffered because HFT firms can no longer exploit structural flaws.

“The loopholes got cleaned up,” said Haim Bodek, a former managing director and head of electronic volatility trading at UBS AG.

One such loophole, according to Mr. Bodek, involved dark pools run by some large banks and brokerages. The off-exchange trading venues need access to the latest price data from exchanges to ensure they are executing trades for customers at competitive prices. In years past, some used a relatively slow public data feed. That makes it possible for a high-speed trader to see a stock price moving a fraction of a second before the dark pool does, and quickly trade against the outdated price available in the dark pool.

Mr. Bodek said that strategy had largely been eliminated as dark pool operators switched to faster feeds. . . .

176. Put simply, HFTs profited from price latency, and that strategy was becoming far less profitable. As the UBS trader interviewed by the Wall Street Journal put it, “[i]t’s like the perfect storm. . . . The cheats are going away, the volatility is going down and the costs are going up.”

177. The HFT boom had ended. There simply was no more room for latency arbitrage in a now-crowded space. That meant that market makers would have to find some other way to make enough money to justify paying for order flow.

178. The HFT movement, however, made clear that when it was profitable to buy order flow, the broker-dealers did nothing to protect their investors. Instead, they frictionlessly sold their clients’ orders to the market makers.

179. That lesson would rear its head in the near future, as market makers found another way to exploit retail investors, and a new arms race to obtain their order flow began.

VI. THE RISE OF AI AND MACHINE LEARNING, AND THE SCRAMBLE TO OBTAIN RETAIL INVESTOR ORDER FLOW

A. The AI and Machine Learning Cambrian Explosion

180. As the HFT era came to a close, a new form of technology was taking hold beginning in 2016 and 2017: machine learning and artificial intelligence using deep neural networks.

181. Traditionally, quantitative investment funds relied on static mathematical models, which they would backtest using historical data—validating a trading strategy by seeing how it would have played out against what had previously happened in the market. Once such a model had been developed, a firm would use it to identify a particular pattern or patterns in the market and exploit them. However, the model would become stale once these patterns ceased to exist in the market, or changed materially such that they could no longer be readily identified by the static model.

182. Moreover, these quantitative models required extensive design and testing by the mathematicians and physicists employed by Wall Street firms. The models required that the funds first identify a pattern—or potential pattern—in the market, then design a model or algorithm to identify and exploit that pattern.

183. Such models had significant drawbacks.

184. First, they required a large amount of human involvement. And not just any human involvement, but laborious design by a small pool of mathematicians and physicists with Ph.D.s and other scarce credentials. This created intense competition for talent among the quantitative funds.

185. Additionally, static models required exceptional secrecy, as discovering a model and its parameters was enough to replicate the trading strategy used by the fund that devised that

model. To highly trained mathematicians and physicists, many quantitative models—even the most sophisticated ones—were readily understandable with just a few inputs, and with just a bit of information could be reverse engineered.

186. This meant that substantial resources had to be devoted to corporate secrecy and anti-espionage—and human “quants” became even more expensive, as losing them to competitors facilitated easy reverse engineering of a firm’s most expensive and competitively important trade secrets.

187. This dilemma reached a high-profile fever pitch when Goldman Sachs reportedly had one of its former quants arrested for allegedly stealing portions of its trading software. As Michael Lewis recounted in a August 2013 article about the quant, the stakes were high for Goldman, including at the quant’s trial. Indeed, when it came to HFT systems, the investment bank appeared to take the position that everything involved was proprietary:

Goldman Sachs’s role in the trial was to make genuine understanding even more difficult. Its lawyers coached witnesses; its employees, on the witness stand, behaved more like salesmen for the prosecution than citizens of the state. “It’s not that they lied,” says Serge [the arrested and prosecuted quant]. “But they told things that were not in their expertise. When [his former boss Adam] Schlesinger was asked about the code, he just said everything at Goldman is proprietary. I wouldn’t say he lied, but he was misunderstood.”

188. The reason for aggressive secrecy in the industry during the HFT era, particularly with respect to employees tasked with writing the source code for trading systems, was that everything was deliberately coded. HFT models often consisted of hard-coded instructions written by programmers. The key ingredient in an HFT model was often the person primarily responsible for building it.

189. Finally, and relatedly, there were regulatory hurdles and risks that resulted from the intentional design of algorithms. Because HFT algorithms were designed and implemented by programmers, it was not difficult to determine the intent of the programmer.

190. Thus, for example, when an HFT system rapidly placed and removed phantom orders to manipulate markets, all one had to do to find intent behind these actions—and thereby hold a firm responsible for some attendant wrongdoing—was to look at the source code or put the creator of the system on the stand. This inherent accountability constrained the range of strategies that an HFT firm could employ—at least without regulatory or legal backlash.

191. All of this was about to change with a new wave of technology. By 2016, machine learning and artificial intelligence had made quantum leaps in effectiveness. A new era in trading was dawning: the era of deep learning.

192. Although algorithms based on mathematical models designed to work as artificial neurons have existed for decades, effective means of training them with data have been lacking, as has been the computing power necessary to train large models. Indeed, it was not until 2016 and 2017 that specialized processors started becoming available at meaningful scale to handle the computations necessary to train large networks of artificial neurons.

193. Most notably, graphics processing units (“GPUs”), which are designed to handle graphics such as those in video games, are uniquely adept at handling vectors of numbers and making multi-dimensional computations. These GPUs became significantly more powerful in the mid-2010s.

194. During this same time period, arrays of GPUs started to become available on cloud computing services, such as Google Cloud and Amazon Web Services, permitting on-demand vector processing at scale by private firms. For the first time, AI could be trained on demand, without having to invest massive amounts of capital in computing power.

195. With these symbiotic hardware advancements came a new class of algorithms. The most important feature of these new algorithms, whether they relied on artificial neural networks or other machine learning paradigms, was that they *learned directly from data*. There are few hardcoded instructions in the new class of machine learning and AI algorithms.

196. Rather, AI systems, particularly those built from multiple layers of artificial neural networks, detect patterns in data without the need for a programmer to provide imperative, step-by-step instructions for a computer to follow.

197. For trading systems based on AI and ML algorithms, the key ingredient is no longer a mathematically inclined individual with a knack for finding exploitable patterns in the market. Rather, the key ingredient for this new class of systems is high-quality data.

198. Because neural network models are trained on data, they are more powerful if they are trained on larger and more representative datasets. Larger amounts of training data help to avoid AI/ML-specific problems like the overfitting or underfitting of a model. That is, when a model fits too tightly with data (overfitting), it essentially memorizes the data, and if the model fits too loosely with the data (underfitting), it makes broad and ineffective generalizations. The antidote to both of these problems is more data—and more-representative data.

199. In the finance world, the data significant to training this new class of AI and ML models is not necessarily (and certainly not solely) price or trend data. AI/ML models can consider diverse sorts of information at once, including foot traffic, weather patterns, consumer prices, currency fluctuations, or any other measure that may be significant to making a particular prediction. Broad, recent data with even non-obvious relevance can be extremely useful to well-formed AI/ML models.

200. As the 2010s came to a close, deep neural networks—multi-layered networks of artificial neurons—were for the first time understanding and processing language with striking

accuracy. For example, OpenAI, a “capped profit” company, invented the GPT-3 large language model in May 2020. GPT-3 is capable not only of processing text-based inputs, but generating text that looks like it was generated by a person, not a computer.

201. GPT-3—developed in the last years of the 2010s with the help of symbiotic hardware advancements—was an expensive and massive accomplishment. It dazzled computer scientists, but also created immense danger that the AI would be abused. As Wired Magazine described the model in July 2020:

The world has a new AI toy, and it’s called GPT-3. The latest iteration of OpenAI’s text generating model has left many starstruck by its abilities—although its hype may be too much.

GPT-3 is a machine learning system that has been fed 45TB of text data, an unprecedented amount. All that training allows it to generate sorts of written content: stories, code, legal jargon, all based on just a few input words or sentences. And the beta test has already produced some jaw-dropping results. But after some initially promising results, GPT-3 is facing more scrutiny.

The model faced criticism last week when Facebook’s head of AI Jerome Pesenti called out bias coming out of a program created with GPT-3. The program in question was a tweet generator; anyone could type in a word and the AI would come up with a relevant, 280-characters-or-less sentence.

202. Large language models like GPT-3 for the first time provided the ability to parse natural language with striking accuracy—and to do it at scale. More critically, however, such models could be used to generate tweets, messages, and Internet traffic that look like they come from real people.

203. Such models are immensely expensive to train, and aside from technology companies like Google and Facebook, financial firms were among the few that had the capital to develop and train them when the computational hardware became available in the second half of the 2010s.

204. If successful with this new type of trading paradigm, financial firms could feed news, SEC filings, tweets, reddit posts, and other natural language into their deep neural network models, then make market predictions no human could make (or program). In addition, financial firms could create buzz around a security with realistic text bots, swaying markets.

205. In addition to large language models, another field of AI had taken off over the same time period—reinforcement learning based on deep neural networks. This technology, often referred to as deep reinforcement learning, had significantly advanced by the end of 2015.

206. The company DeepMind—eventually bought by Google—had used this class of algorithms to teach computers to play Atari games. DeepMind’s AI not only beat human players after significant training, it found unique, winning strategies.

207. In October 2015, DeepMind had built AlphaGo, a deep reinforcement learning system that ultimately beat the world champion in the game of Go¹—a massive AI achievement given the complexity of the game. By December 2017, DeepMind had built AlphaZero, an AI system that was capable of defeating not only humans, but world champion chess programs. The prestigious journal *Science* referred to a successor to AlphaZero as “One program to rule them all”:

Computers can beat humans at increasingly complex games, including chess and Go. However, these programs are typically constructed for a particular game, exploiting its properties, such as the symmetries of the board on which it is played. Silver *et al.* developed a program called AlphaZero, which taught itself to play Go, chess, and shogi (a Japanese version of chess) . . . AlphaZero managed to beat state-of-the-art programs specializing in these three games. The ability of AlphaZero to adapt to various game rules is a notable step towards achieving a general game-playing system.

¹ Go is an abstract strategy board game, invented in China more than 2,500 years ago, that is renowned for its extreme complexity despite relatively simple rules.

208. Deep reinforcement learning systems essentially allow an AI to train on massive amounts of trial and error, using deep neural networks to find the best moves at any point. These systems can develop “intuition” much like a human can. Most importantly, they learn directly from data without any imperative instructions by programmers. Once trained, these programs can generate approaches to games that humans would not think of.

209. For example, in a game against Go world champion Lee Sedol, Google’s AI energized spectators with a baffling, but powerful move. Wired magazine reported on the match on March 14, 2016:

The move didn’t make sense to the humans packed into the sixth floor of Seoul’s Four Seasons hotel. But the Google machine saw it quite differently. The machine knew the move wouldn’t make sense to all those humans. Yes, it knew. And yet it played the move anyway, because this machine has seen so many moves that no human ever has. . . .

It was a move that demonstrated the mysterious power of modern artificial intelligence, which is not only driving one machine’s ability to play this ancient game at an unprecedented level, but simultaneously reinventing all of Google—not to mention Facebook and Microsoft and Twitter and Tesla and SpaceX.

210. These AI systems presented the world of finance with a powerful new edge—one that did not require frontrunning with lightning-fast connections to an exchange.

211. Instead, the new AI and ML systems required data as fuel. The financial firms that could harvest the most predictive data could dominate and corner securities markets. They did so by making predictions from data, with the middlemen—humans—cut out.

212. The leap from games to trading systems was not large, and financial firms immediately saw the power of the new technology.

213. It was also obvious to leading financial firms that AI built on machine learning algorithms such as deep neural networks reduced many of the problems that had plagued the HFT world.

214. First, secrecy was far less important. AI and ML models are built from data. The actual models themselves in most cases are trivial in comparison to the massive amount of data processing, cleaning, and updating that is required to train them in a live setting. As a result, building bleeding-edge quantitative trading systems was no longer about finding the smartest math Ph.D.s that could mine data for patterns, then retaining them at all costs. Losing a programmer was similarly no longer the end of the world. Without the data, these humans would be near-useless to a competitor.

215. Second, the new AI and ML systems did not require massive code bases and complex programming that would have to be maintained and updated. Instead, the models merely needed to be provided up-to-date streams of actionable and predictive data. Once the deep neural networks and other similar AI or ML models were trained, they required little human maintenance to function, particularly if a firm's data infrastructure was sufficiently robust.

216. Finally, and relatedly, this new form of AI subverted most of the securities and criminal laws, which often require intent or scienter for liability or criminal culpability. The reason for this is the "black box problem." Deep neural networks, once trained, cannot easily be audited to determine why predictions were made. The trained neural network's decision process becomes a black box—opaque even to the creators of the AI.

217. For financial firms, this was not a bug, but a feature. If no programmer designed an AI system's trading strategy, there would be no design document, no source code, and no witness to put on the stand to determine intent. Rather, the AI had made decisions and devised strategies based on the data it was given. In fact, strategies implemented by a trading AI may be so

complicated that market manipulation may be undetectable. Like Google's Go-playing AI, a trading AI may find profitable patterns and strategies imperceptible or even incomprehensible to humans.

218. Put simply, the black box ensured no criminal or fraud-based liability would attach for aggressive—even illegal—trading tactics. Moreover, regulators could not easily audit how a firm's systems worked. In fact, in many cases, *no one* could do so—not even the creators of the profitable AI.

B. Machine Learning and AI Driven Hedge Funds Emerge

219. By 2016, a new cohort of trading firms emerged to take advantage of the explosion in AI and machine learning technology. Firms such as Two Sigma, Citadel, and the D.E. Shaw Group began to dominate capital inflows, capturing \$4.6 billion of net new investments in the first quarter of 2017. These firms doubled their share of stock trades in three short years, moving from 14% of the market in 2013 to 27% in 2016.

220. The new sea change in trading appeared to render traditional trading methods far less effective. The Wall Street Journal recounted the transition to machine-assisted trading in May 2017, noting, for example, the transition by Steven A. Cohen's hedge fund, Point 72 Asset Management:

Hedge-fund billionaire Steven A. Cohen's investment firm, Point72 Asset Management, with \$12 billion in assets, is shifting about half of its portfolio managers to what it calls a "man plus machine" approach.

Teams that use old-school research methods are working alongside data scientists. Financial analysts are taking evening classes to learn data-science basics. Point72 is plowing tens of millions of dollars into a group that analyzes reams of data, including credit-card receipts and foot traffic captured by apps on smartphones. The results are passed on to traders at the Stamford, Conn., investment firm.

Point72 lost money in most of its traditional trading strategies last year, say people familiar with the results. The firm's quant investors made about \$500 million.

221. By October 2017, Two Sigma had vaulted to over \$50 billion in assets under management and had amassed one of the largest team of quants in the industry. More than half of Two Sigma's 1,200 staff came from outside of the finance industry, with most educated in mathematics and computer science.

222. By the second half of the 2010s, it was clear that any new edge in predicting market direction would come from massive amounts of rich data, and the patterns that could be gleaned from it. One particularly rich set of such data—one hitherto untapped by powerful AI/ML models—was retail order flow.

C. Machine Learning Funds Enter the Market Making Business and Clamor for Retail Order Flow

223. Although money management was rapidly changing, there was already a business that had a ready-made computing infrastructure to take advantage of the new class of AI: market making.

224. Market makers had invested heavily in automated systems during the HFT boom, and already had access to large amounts of historical data. It was not a large leap to begin building AI and machine learning systems instead of automated, hard-coded ones—and to begin unleashing these new AI/ML systems

225. The greatest challenge, however, was data. Price data, which provides significant information, is nonetheless often insufficient to find market inefficiencies or make viable predictions about price movements. In order for AI/ML models to drive profits for market makers, price and trend data would need to be augmented.

226. Institutional traders often obfuscated their orders or executed their orders in ways that were not transparent to exchanges or other market participants. These institutional investors were notoriously difficult to trade against.

227. Retail investors, however, presented the markets with actionable mispricing and market inefficiencies. Trading against a retail investor was potentially very profitable. This insight was, of course, not new. In fact, it was the very premise of payment for order flow: retail investors were such a potential source of profit, it could be worth paying to trade against them, as long as the market conditions were right.

228. The rise of AI- and ML-driven trading presented just such a condition. In the late 2010s, AI and ML presented a new value proposition for retail order flow: data for trading models.

229. Institutional investors almost all trade off-exchange, as their orders are routed by broker-dealers to market makers, with pricing that is largely predictable. In many cases, a good portion of the orders placed by unsophisticated retail investors are in the opposite direction of the rest of the order flow. With AI and ML models, market makers could use order flow data to make price predictions, then trade against unsophisticated investors on the wrong side of the market.

230. The same predictive value allowed market makers to continue their arbitrage of the NBBO prices, which supposedly ensured price improvement. Now, retail investor order flow could be used to detect impending price gaps, allowing the sort of arbitrage that the HFT world profited from, but without the frontrunning of clients. Like the HFT funds, however, market makers using AI and ML would have the regulatory cover of pretending like they achieved price improvement with respect to the NBBO price.

231. To the hedge funds already enmeshed in the world of AI- and ML-based predictions, moving into market making was a natural expansion of their new edge.

232. By 2016, Ken Griffin, CEO and founder of Citadel Securities, had also executed a pivot from HFT strategies, moving aggressively into market-making for equities.

233. In February of 2016, Citadel purchased KCG Holdings' market making business, giving Citadel a presence on the New York Stock Exchange. KCG, like Citadel, executed retail orders—orders from unsophisticated customers of the retail brokerages.

234. Faced with a new way to obtain insight into market direction, KCG, Citadel and other market makers aggressively scrambled to buy more order flow. Indeed, with the rise of AI- and ML-trading models, more order flow meant more data that could be mined and more profits to be extracted from trade internalization.

235. The scramble to capture retail order flow reignited the debate over the practice of payment for order flow. And by May 2016, the U.S. Justice Department and other state regulators began issuing subpoenas to market makers, including Citadel.

236. As the Wall Street Journal reported that May of 2016:

The inquiries into historical trading practices at KCG and Citadel Securities go to the heart of the complex world behind stock trading. The two companies are the biggest players in what is called “wholesale market-making,” where high-speed intermediaries handle trades on behalf of big retail brokerages such as Fidelity, TD Ameritrade and Scottrade.

In practice, when a retail investor uses a market order to buy a particular stock in his or her account, the broker almost always routes it to KCG, Citadel or a handful of smaller wholesale market makers. The wholesaler then completes the trade by matching it with an opposite order in its own inventory or going onto the stock market to find a match.

Wholesalers make tiny profits on many of those trades; over time, they add up to tens of millions of dollars. KCG had revenue of \$258.9 million and pretax income of \$75.5 million in its market-making division during the first quarter of 2016. The profits are primarily driven by wholesale market-making but the firm also does other types of market-making.

237. As the Wall Street Journal explained, the brokers received payments, and the customers supposedly received “price improvement”:

Part of the money wholesalers earn is often paid back directly to the broker in a practice known as “payment for order flow.” Retail investors are given a “price improvement,” meaning the price at which they are ultimately executed might be slightly cheaper if they are buyers or a bit higher if they are sellers.

238. Citadel predictably defended itself with its repeated mantra that it was providing price improvement—as did the rest of the industry. The problem, of course, was that the NBBO price was once again the means of measuring “price improvement”—and it was, by definition, stale, as market makers were rapidly capturing all order flow before it could ever reach any exchanges, then mining that order flow data for price predictions.

239. If the NBBO was problematic during the HFT era, it was outright misleading in machine learning times. As long as Citadel and other market makers beat the NBBO price by even a fraction of a penny, they could feign price improvement. The truth, however, was that they had used systemic problems in the NBBO pricing system to unlock a cash cow—a means of mining order flow for insight, then systematically exploiting that order flow for profit, all while pointing to a stale metric as justification.

240. Other quantitative firms also clamored to obtain retail order flow. In May 2017, Two Sigma bought an options market-making business from the Interactive Brokers Group—a retail broker that helped pioneer electronic trading in the 1980s.

241. As the Wall Street Journal reported on May 10, 2017, Two Sigma’s move pitted it directly against Citadel:

The deal is designed to push Two Sigma Securities—a relative upstart founded in 2009—into the big leagues, alongside global giants such as Citadel Securities LLC, which account for a huge portion of trading activity in the U.S. and overseas.

“Over time, I see us expanding into other asset classes and other geographies,” Two Sigma Securities Chief Executive Officer Simon Yates told the Wall Street Journal.

242. Two Sigma was quickly obtaining a significant percentage of retail order flow. It achieved this rapid rise by aggressively paying for order flow from brokers:

New York-based Two Sigma Securities says it trades more than 300 million shares daily, which means it handles from 4% to 5% of the shares that change hands each day in U.S. markets. By comparison, Citadel accounts for about 20% of U.S. daily volume, and Virtu expects to have a similar market share to Citadel’s if it completes its acquisition of KCG.

Two Sigma Securities enjoys such huge volumes, in part, because it takes part in a controversial practice called “payment for order flow”—meaning it pays online brokerages such as TD Ameritrade Holding Corp. and Charles Schwab Corp. to execute orders submitted by retail investors.

243. In August 2017, another firm, Virtu, bought another portion of KCG’s business, KCG Holdings Inc., giving it a foothold into the retail market-making business. The combination would give Virtu control over approximately one in five of the U.S. equities traded. As the Wall Street Journal reported on August 20, 2017:

Combining Virtu and KCG would create a high-frequency trading firm responsible for around one-fifth of the volume in U.S. equities, roughly the same market share as the current leader, Citadel Securities LLC. High-frequency traders use powerful computers to buy and sell stocks, bonds or other financial assets in fractions of a second.

244. The value of the deal came from the massive trove of unsophisticated retail order flow:

Executing retail orders is an attractive business for high-speed traders, because small investors are unlikely to submit an order in the split second when a stock’s price is about to move—a risk when dealing with more sophisticated players. But wholesaling is controversial, because of fears that the firms could be making money at small investors’ expense. Defenders of the practice say it actually leads to better results for retail investors.

Virtu Chief Executive Douglas Cifu said his firm's trading algorithms would thrive in KCG's retail customer pool. "We fight in the all-to-all market," he said. "We fight in the jungle. We built this firm without the benefit of any customer order flow."

245. By 2018, Bloomberg reported that Virtu had captured \$1.9 billion in trading revenue, and Citadel \$3.5 billion.

246. Each company continued to clamor for more, increasingly valuable order flow, expanding inducements to retail brokers for their retail investors' orders.

247. The key, however, was not just to capture order flow, but to lock that order flow into an ecosystem of off-exchange market makers. All the PFOF strategies depended on preventing trading prices from making it to public markets—thereby keeping the NBBO prices stale.

248. Orders quietly filled, even by a competitor, were better than orders filled in plain view of the trading public. As long as retail orders never made it to an exchange, market makers would have the cover of stale NBBO prices to feign price improvement.

VII. THE RACE TO "ZERO" COMMISSIONS

A. The Rapid Consolidation of Retail Brokers

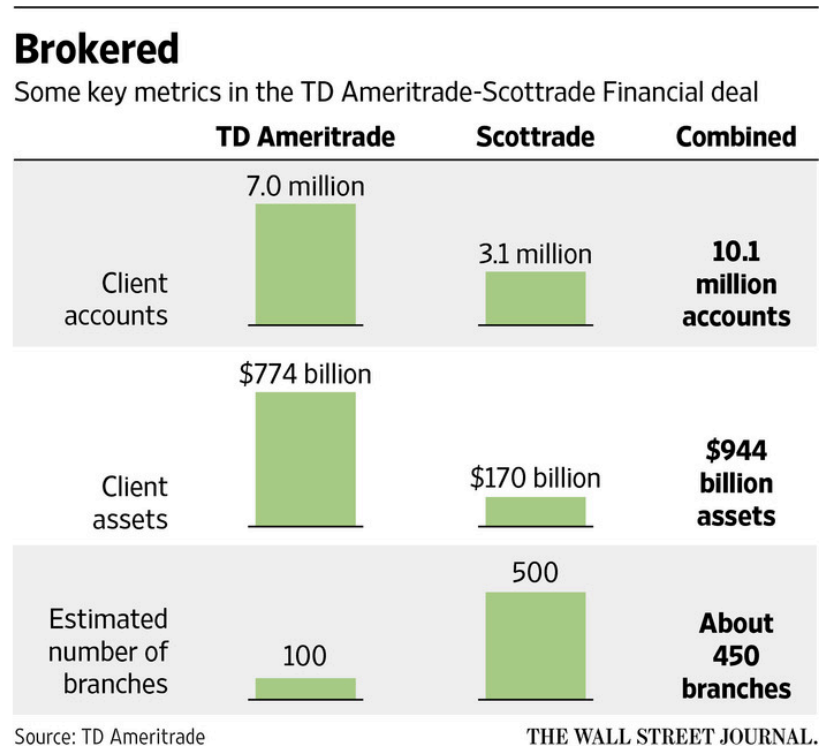
249. As market makers were clamoring to capture the retail order flow, the broker-dealers were consolidating.

250. On July 25, 2016, E*Trade Financial acquired Aperture New Holdings, Inc., the parent company of OptionsHouse, for \$725 million in cash. The acquisition placed OptionsHouse's active, retail derivative traders in E*Trade's hands. By September 2017, the companies had integrated platforms.

251. On October 24, 2016, TD Ameritrade announced that it would acquire its rival broker Scottrade. The acquisition gave TD Ameritrade a huge mass of accounts and assets. That is, for \$4 billion, TD Ameritrade, which previously controlled 7 million accounts and \$774 billion

in client assets, would combine with Scottrade's 3.1 million accounts and \$170 billion in client assets. Much of the combined customer and asset base was from non-institutional, retail investors.

252. The combined TD Ameritrade-Scottrade entity would have 10 million client accounts and nearly \$1 trillion in assets, making it the second largest force among retail brokerages, but still behind Charles Schwab Corp.'s \$2.7 trillion in client assets.



253. By 2019, there were only a handful of retail brokerages operating at scale—namely, TD Ameritrade, Charles Schwab, E*Trade, Interactive Brokers, and Fidelity.

B. A New Competitor Emerges Catering Exclusively to Individual Investors

254. In 2013, Vlad Tenev and Baiju Bhatt founded a new brokerage they named Robinhood. Inspired by the Occupy Wall Street movement, Robinhood's founders set out to make trading frictionless for millennials—namely through a mobile app.

255. The new app was fast and introduced gamification and other fast-feedback features, such as confetti bursts for transactions, lottery scratch-off features, and notifications for earnings calls.

256. Trading through the app began in 2015, but unlike other brokerages, which typically charged \$5 to \$15 per trade, Robinhood allowed trading for free. Moreover, Robinhood did away with account minimums, allowing small account holders to frequently trade in small amounts. Robinhood even gave new users free stock when they joined.

257. Robinhood had determined that there was more value in obtaining payments for large amounts of unsophisticated order flow than in charging commissions, and Robinhood's user base—mostly small dollar, young investors—was as unsophisticated and numerous as they came.

258. As Quartz explained in a September 19, 2020 article, “retail customers are fresh, red meat”:

The every day investor is less informed and trades differently than the pros, who in theory, move in and out of assets more efficiently. Retail and institutional trades may flow in opposite directions, which is great for market makers who can provide bids to buy for one and offers to sell for the other. It's also less risky: When trading on a public exchange, market makers have to compete with other sophisticated traders, as well as large investors who may buy or sell large chunks of shares, sending shockwaves through prices.

259. Robinhood's investors were not even middle-aged professionals, or older individuals who had accumulated wealth and actively invested in the stock market. They were millennials making relatively small trades, and they lacked the sophistication or the incentive to spend much time studying investments. They were definitionally some of the most valuable customers to market makers who wanted to trade against them.

260. Robinhood's entire business model was to monetize this uniquely unsophisticated, yet uniquely voluminous, order flow. For Robinhood, the value of its order flow depended on

trading volume, as it was paid per share that it diverted to market makers. Everything Robinhood did was geared towards increasing the number of shares traded on its platform. To do so, it aggressively removed all forms of friction.

261. Robinhood rapidly grew. By the end of 2019, it had accumulated 10 million users.

Number of users of Robinhood from 2014 to 2021

(in millions)

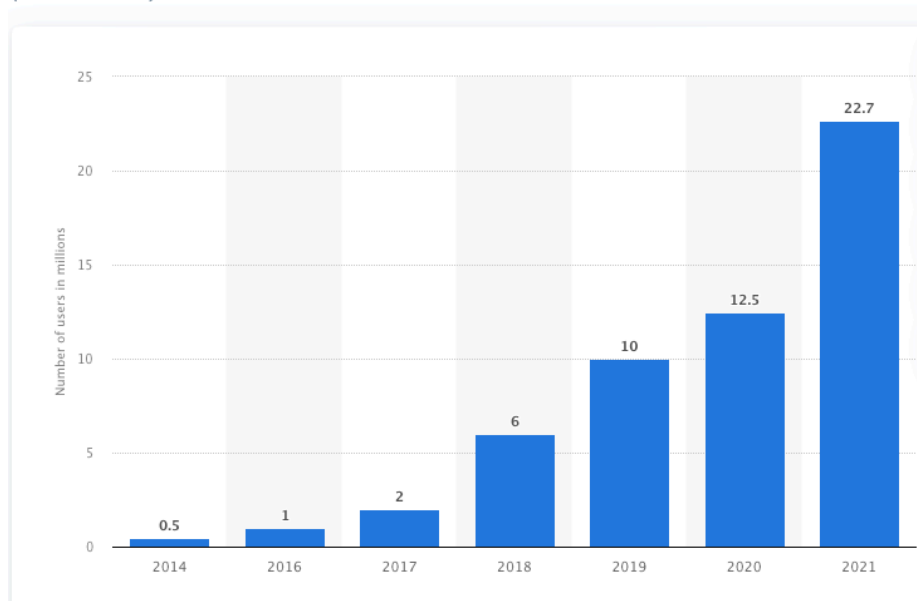


Figure 1: Source Statista 2022

262. Robinhood continued its exponential growth year after year, not only increasing in number of users, but in number of shares traded on its platform.

263. The growth of the new company was disruptive, but not as much as its new business model. By offering zero commissions, Robinhood had appeared to undercut other brokerages. Of course, there were hidden costs associated with its business model of making money exclusively through payment for order flow.

C. The Path to Zero

264. Robinhood's new business model caused a dramatic shift in the market for retail brokerage services. The new model did not depend on commissions for revenue, but instead relied entirely on payments from market makers to broker-dealers make money.

265. In the past, retail brokers had accepted payment for order flow, but the dynamics had abruptly changed with the race to "zero" commissions. Since a broker's clients no longer paid any part of the bill in the form of commissions, a broker's profitability suddenly relied completely on accumulating valuable order flow, and selling it to one or more of the market makers. The retail brokerage business had shifted from providing or selling investment resources, trading tools, or research as part of a commission-driven business model, to focusing on maximizing the number of shares traded on the brokerage platform.

266. One by one, the major retail brokers adopted Robinhood's new payment-for-order-flow business model, with each profiting from retail trades almost exclusively by receiving an order flow kickback from market makers.

267. On October 1, 2019, Charles Schwab announced it was moving to zero commissions. It had previously charged \$4.95 for trades. Within days, other rivals—including TD Ameritrade, E*Trade, and Interactive Brokers—also moved to zero commissions.

268. In 2018, Schwab had reported \$139 million in order flow revenue, and \$114 million the year before. Its task now that it had done away with commission revenue was to maximize the size of the order flow it had to offer market makers.

VIII. MARKET MAKERS PROFIT FROM THE NEW BROKER-DEALER BUSINESS MODEL

A. The Payment for Order Flow Model Creates Massive Profits for Market Makers

269. By early 2020, market makers such as Citadel were paying hundreds of millions and even billions of dollars for retail order flow. They did so because they were making far more than what they paid by trading against what they viewed as “dumb money.”

270. The order flow purchased by market makers not only provided them with real-time market information that they could supply to their machine learning and AI models, it also allowed them to trade against retail investors, locking in large margins from the spread between what they purchased from and sold to retail investors.

271. By June 2020, Citadel in particular was harvesting giant profits from retail order flow, particularly from Charles Schwab and TD Ameritrade. As the Financial Times reported on June 21, 2020:

Chicago-based Citadel Securities accounts for 40 of every 100 shares traded by individual investors in the US, making it the number one retail market maker, according to Piper Sandler. The company is a big buyer of customer trades from the leading US retail brokerages such as Charles Schwab and TD Ameritrade, which have slashed commissions to zero to keep up with fast-growing challengers such as Robinhood.

Citadel Securities pays tens of millions of dollars for this order flow but makes money by automatically taking the other side of the order, then returning to the market to flip the trade. It pockets the difference between the price to buy and sell, known as the spread.

272. The move to zero commissions and an increase in retail trading volume became a massive profit center for market makers, such as Citadel and Virtu. Retail spreads for both equities and stocks widened significantly, creating larger profit margins for market makers that traded against the very orders they filled.

273. By the spring of 2020, spreads on Russell 1000, S&P 500, and the Nasdaq Composite stocks, which had historically hovered around 2 basis points, had spiked by more than 3- and 4-fold in a short amount of time, with the spread on Nasdaq composite stocks sextupling to more than 12 basis points.

274. TD Ameritrade repeatedly assured press outlets that it was ensuring that its clients received fair prices. Of course, TD Ameritrade did not and could not know whether the prices it was offering its clients were actually fair—a problem noted by the SEC years earlier. And worse, in an entirely new problem, TD Ameritrade did not and could not know what strategies market makers were employing when trading against its retail clients: the market maker’s new trading systems were not only proprietary, they were built on black-box machine learning and AI models.

B. Payment for Order Flow Creates Profits for Broker Dealers and Provides Little Value to Retail Clients

275. As spreads widened, market makers made more money, and in turn, kicked back larger sums to broker-dealers that fed them steady streams of retail order flow.

276. Broker-dealers received hundreds of millions of dollars in what were essentially kickbacks from market makers like Citadel, Virtu, and Two Sigma.

277. Citadel, in particular, had captured a large share of the retail order flow by the middle of 2020. Forty of every 100 shares traded by individual US investors were traded through Citadel Securities.

278. Market makers that paid for order flow made far more in revenues than they paid out to broker-dealers for order flow. They did so by trading against retail investors, and the brokerage firms that herded those investors to the market makers also profited heavily.

279. Retail investors, however, received only the assurance that they received “price improvement” in the form of a trade below the risibly stale NBBO price.

280. The only motivation retail brokers had to share their newfound wealth with their clients was competition among the brokerages for retail investor trades—*i.e.*, for retail order flow. And individual and retail investors were the producers of this valuable order flow.

281. However, explained below, that competition, which was one of the last safeguards against flagrant market abuses by retail brokerages, diminished significantly—if not disappeared—after two retail brokerage giants became one in October 2020.

IX. THE SCHWAB AND TD AMERITRADE MERGER

282. On November 25, 2019, Charles Schwab announced that it was buying its fiercest rival, TD Ameritrade Holding Corp., in a stock-swap transaction then valued at about \$26 billion.

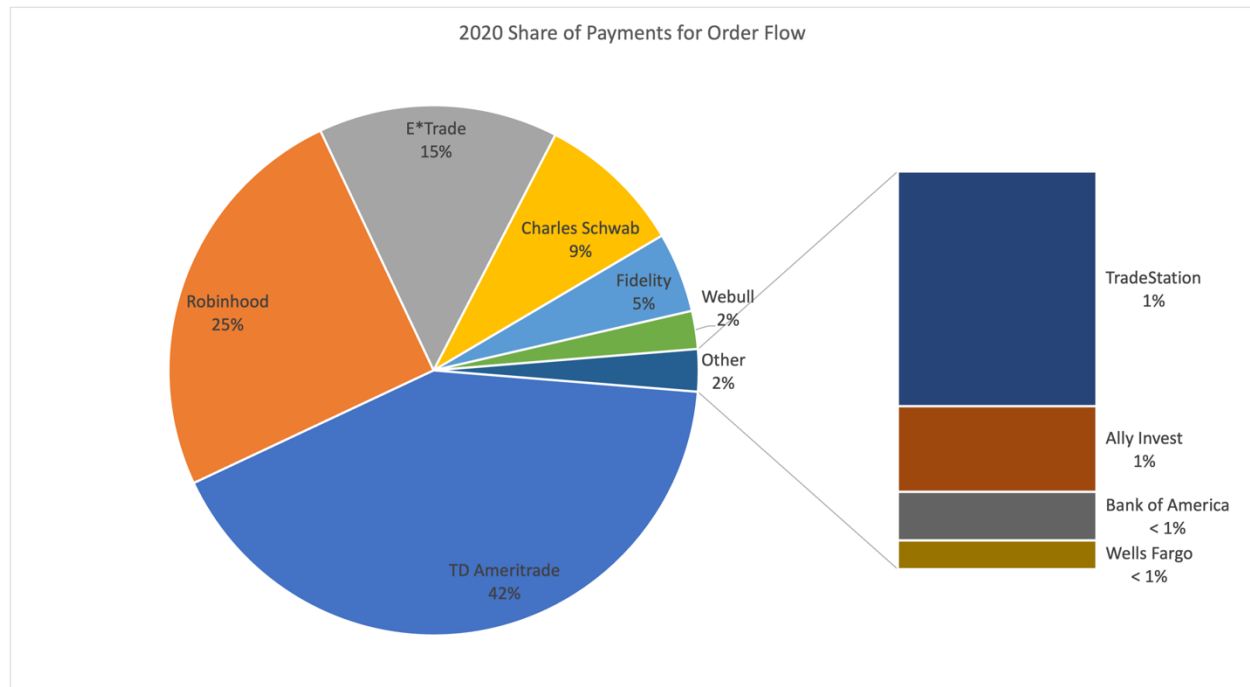
283. The move consolidated two of the largest retail brokers, consolidating a massive amount of order flow to be sold to market makers. The combined company would serve 24 million brokerage accounts and oversee more than \$5 trillion in client assets.

284. On October 26, 2020, the merger was completed at approximately \$22 billion in value (the “Merger”), resulting in a combined firm consisting of TD Ameritrade’s and Schwab’s retail brokerage operations (the “Merged Entity”).

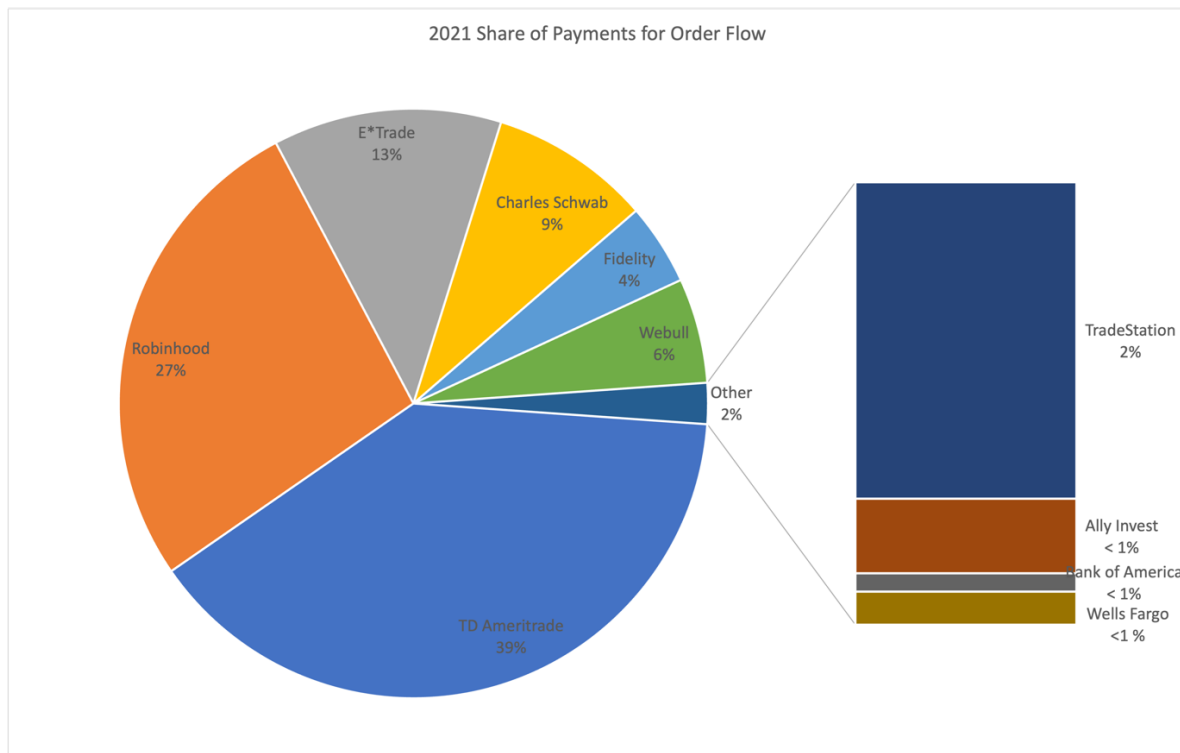
285. By acquiring TD Ameritrade, Schwab had captured the lion’s share of order flow payments across retail investment platforms. TD Ameritrade alone received approximately 1.15 billion in order flow payments in 2020, approximately 42% of the \$2.752 billion in order flow payments made that year.

286. In comparison, Schwab had approximately 9% of the order flow payment share in 2020. Combined, the companies received just more than half of all the order flow payments made by market makers to retail brokerages in 2020.

287. The two companies together provided the largest aggregation of retail order flow from individual investors in the United States in 2020. The next highest share belonged to Robinhood, at 25% of all payments for order flow in 2020.



288. The companies together maintained approximately half of the order flow in 2021 as well, with TD Ameritrade at about 39% of the \$3.6 billion in order flow paid in 2021 and Schwab at 9%. While order flow payments grew approximately 32% from 2020 to 2021, the combined companies maintained their combined share of approximately half of those payments.



289. Since order flow payments are typically made on a per share (or calculated on a per share) basis, the order flow shares also represent each firm's share of trades made by retail investors during 2020 and 2021.

290. The market became significantly more concentrated after the Merger. The Herfindahl-Hirschman Index (HHI) of the market shares above, a commonly accepted measure of market concentration, had grown by the end of 2020 from 2,729 pre-Merger to 3,485 post-Merger, when combining the Charles Schwab and TD Ameritrade shares of the payments for order flow.

291. The U.S. Department of Justice, according to its Horizontal Merger Guidelines, considers HHIs between 1,500 and 2,500 to be moderately concentrated, and markets in which the HHI is in excess of 2,500 points to be highly concentrated.

292. HHI increases of more than 200 points are presumed likely to enhance market power under the Horizontal Merger Guidelines. The 2020 increase from the TD Ameritrade and

Schwab merger resulted in a 759 point increase. This level of market concentration persisted into 2021, after the completion of the merger, with an HHI of 3,244.

293. For the market makers, the merger made TD Ameritrade and Charles Schwab the largest source for retail investor order flow. As explained below, this provided the Merged Entity with significant power to keep more of the order flow payments for itself than its entities otherwise would have without the merger—substantially more.

X. THE RELEVANT MARKETS

A. The Retail Order Flow Market

294. The relevant market is the Retail Order Flow Market (“ROFM”). Retail brokers, such as Schwab and TD Ameritrade, purchase retail order flow from individual investors and sell that order flow to market makers such as Citadel or Virtu. The “price” for a particular individual’s order flow is a portion of the payment for order flow that is remitted to the individual investor by the broker-dealer as a part of the investor’s trade—through a rebate, a price improvement, or some combination of the two.

295. Plaintiffs and Class Members are producers/suppliers of retail order flow in the ROFM; retail brokers like Schwab and TD Ameritrade are direct purchasers, who obtain retail order flow from Plaintiffs and the Class Members (and, in the overall ROFM, from other individuals who trade retail securities) in exchange for trade execution services, which include the fulfillment of these brokers’ duties to obtain the best execution for a particular retail trade as well as rebates and/or price improvements remitted to the individual investor as part of a trade.

296. Retail brokers (*e.g.*, Schwab and TD Ameritrade) sell the order flow they acquire from Plaintiffs, Class Members, and/or other individuals who trade retail securities to internalizers and market makers (*e.g.*, Citadel or Virtu), receiving a payment in the form of cash and/or other valuable inducements. This payment to the retail broker is remitted in whole or in part to the retail

client (*e.g.*, a Plaintiff or a Class Member) as part of a trade made through the broker-dealer that generated valuable order flow. The share of the payment for order flow that is remitted to the retail client as part of a trade can be in the form of a rebate, a price improvement, or some combination of the two.

297. Retail brokers like Schwab and TD Ameritrade—buyers in the ROFM—compete to obtain order flow from individuals who trade retail securities (like Plaintiffs and Class Members), who are the sellers in the ROFM. Price competition takes the form of the share of payment for order flow that is remitted as part of a trade to individuals who trade securities like Plaintiffs and Class Members. Thus, increased competition in the ROFM can be expected to result in a higher share of payment for order flow that is remitted as part of a trade from retail brokers to their clients like Plaintiffs and Class Members, whether as a greater rebate, a greater price improvement, or a combination of the two. Decreased competition in the ROFM can be expected to result in a lower share of payment for order flow that remitted as part of a trade from retail brokers to their clients like Plaintiffs and Class Members.

298. Since October 2019, the ROFM is where most retail trades are fulfilled. Plaintiffs and Class members are individuals who seek to trade securities, including stocks and options, and in order to trade these securities with a particular retail broker, Plaintiffs and Class Members allow that broker to sell their order flow to internalizers and market makers. Retail brokers compete to obtain trades from individuals who seek to trade securities by remitting to clients as part of a trade greater shares of the order flow payments the brokers receive from internalizers and market makers, in the form of higher rebates, greater price improvements on shares bought/sold, or some combination.

299. Two competitive forces contribute to the efficiency of the ROFM.

300. First, retail brokers seek to maximize the amount of payment they receive for the order flow they provide internalizers and market makers. This payment is maximized by providing the largest number of generally unsophisticated retail trades to internalizers and market makers.

301. A retail broker with a larger amount of order flow will have greater bargaining leverage with market makers than one with a lesser amount.

302. A retail broker with access to a larger amount of order flow can generally demand a higher price per share for the order flow it sends to market makers.

303. Second, retail brokers compete with each other to obtain order flow from their retail customers—largely individual investors. Retail brokers compete on the share of payment for order flow that they remit to their retail clients as part of a trade, in the form of a rebate, of price improvement, or some combination of these.

304. In a less concentrated market of retail brokers in the ROFM, competition is more aggressive, with larger portions of the received payment for order flow remitted to customers as part of a trade, including by obtaining more price improvement, by providing a rebate, or some combination.

305. In more concentrated markets, customers have fewer options to execute trades and retail brokers keep more of the payment they receive for order flow for themselves.

306. Put simply, the producers of valuable retail order flow are individual investors who trade securities—*e.g.*, Plaintiffs and Class Members. Retail brokers (*e.g.*, Schwab and TD Ameritrade) acquire that order flow from the individual investors (*e.g.*, Plaintiffs and the Class Members); sell it to internalizers / market makers like Citadel and Virtu; and remit a portion of this payment for order flow to the retail investor as part of a trade (through a rebate, price improvement, or some combination) as the “price” for that investor’s order flow.

B. The Retail Order Flow Market Is a Distinct and Well-Defined Market

307. The ROFM is a distinct sub-market of the overarching market for securities order flow. The broader market includes all securities order flow, including from institutional investors. The ROFM includes only retail order flow, which is regarded as distinct by market participants, consisting of a distinct group of customers, and based on distinct pricing.

308. Because payment is made to retail brokers for unsophisticated, retail order flow, there is no cross-elasticity of demand with respect to other order flow, such as those from hedge funds. In fact, other order flow is serviced by different types of brokers, like prime brokers.

309. Retail broker clients, such as Plaintiffs and the Class Members, generate the product bought and sold in the ROFM, which are securities trades, namely stock and options trades, made by retail and individual investors. These trades are aggregated by retail brokers and sold to market makers and internalizers.

310. In other words, Plaintiffs and the Class Members are producers in the ROFM. They are the source of the trades that are sold by broker-dealers to market makers for fulfillment. Market makers, such as Citadel and Virtu, use these mostly equity and equity options trades to determine the direction of the market and to trade against the unsophisticated order flow for profit.

311. Retail broker clients, like Plaintiffs and the Class Members, receive trade fulfillment / order execution services and a remittance (*e.g.*, a rebate or price improvement remitted to the retail client as part of a trade, tied to the payment for order flow received by the broker) in exchange for their order flow. The retail brokers profit by retaining some portion of the payments made for order flow by internalizers and market makers.

312. Several relevant factors indicate that the ROFM is a distinct market, including a distinct and separate market from the general market for securities order flow.

313. *Industry or public recognition of the submarket as a separate economic entity.*

Retail order flow is treated distinctly from other order flow not only by brokerages, but also by market makers and even by the Securities and Exchange Commission.

314. As the SEC recognized in an October 14, 2021, report, titled “Staff Report on Equity and Options Market Structure Conditions in Early 2021,” unlike other order flow, retail and individual order flow is routed to market makers, not to exchanges:

Retail brokers commonly send the orders of their individual investor customers to off-exchange market makers, one example of a practice called “segmentation.” For stocks, off-exchange market makers may execute individual investor orders by taking the other side of the trade principally (“internalizing” the trade) or may route the order to other trading venues for execution. For options, off-exchange market makers act as “consolidators” by purchasing individual investor options order flow. They cannot execute that flow off exchange because The Options Clearing Corporation (“OCC”) generally only accepts for clearing standardized listed options that traded on an exchange. Instead, they choose the options exchange on which to execute the orders, perhaps based on where they (or an affiliate) are most likely to trade with the order as principal.

315. As explained in the SEC report, even options trades, which must go through exchanges for clearing, are consolidated by off-exchange market makers, who may trade against retail investors through an affiliate.

316. Moreover, the very value of the retail order flow in the ROFM comes from the lack of sophistication of the investors providing the trades.

317. In other words, the retail order flow, is by definition, *segmented* order-flow, distinct from other more sophisticated or more informed order flow. As the SEC stated in its report:

Off-exchange market makers use segmentation to mitigate one of the key risks traders face—price moving against their positions after executing a trade. Some in the marketplace may possess superior information about underlying asset values and will only buy when posted prices are low relative to their information, and sell when they are high. Other participants may, by virtue of greater quantities of data, have statistically greater predictive ability regarding the

direction of prices. Because market makers are more likely to lose money when interacting with such order flow, they have an incentive to distinguish order flow that does not correlate with future price movements from order flow that does.

318. Relatedly, broker-dealers can only sell retail or individual order flow to market makers. In fact, sophisticated or institutional order flow would assign a negative value to market makers because such market participants may possess greater information or other market advantages in comparison to the market makers buying order flow.

319. Publicly, including on Wall Street, retail investors, who are the producers of retail order flow, are viewed as a distinct segment of equities and options investors. As the New York Times reported in the beginning of 2021: “On Wall Street, individual investors are often derided as ‘dumb money,’ destined to lose against the highly compensated analysts and traders who buy and sell stocks for a living.”

320. *The product’s peculiar characteristics and uses.* As explained above, retail order flow derives its value from its peculiar characteristics, namely the lack of sophistication and information among investors who trade and produce order flow.

321. Trades by institutional investors or sophisticated investors with superior information would not fit the definition of retail order flow, as those trades would not have the unique characteristics of unsophisticated or generally uninformed individual investors.

322. Retail order flow, including options order flow, is also marked by distinct order sizes. Retail order flow is composed of relatively small orders. With respect to options, retail order flow requires aggregation before fulfillment.

323. Other forms of order flow, particularly institutional order flow, consist of larger order sizes. These orders are often so large that they must be obfuscated from other market participants, including by slicing the orders into smaller pieces, to avoid moving markets as a result

of trades. Retail order flow lacks this characteristic. Indeed, retail orders are aggregated together for internalizers / market makers, not sliced into smaller pieces.

324. ***Unique production facilities.*** Retail investors who produce retail order flow generally transact through online brokerages, such as TD Ameritrade and Charles Schwab. They do not transact directly through exchanges, nor do they generally invest through brokerages that charge high commissions, as their order sizes are generally too small to justify high percentage or high flat-rate commissions charged by full-service brokerages.

325. Retail investors do not subscribe to high end data sources, such as Bloomberg, which provides a high-priced data and terminal system used by professional traders. As such, retail investors rely on facilities provided by retail brokerages to transact.

326. For example, TD Ameritrade provides the “thinkorswim” application to its clients so that they can monitor securities prices and make trades. Retail brokerages generally do not provide securities quotation services to professional investors.

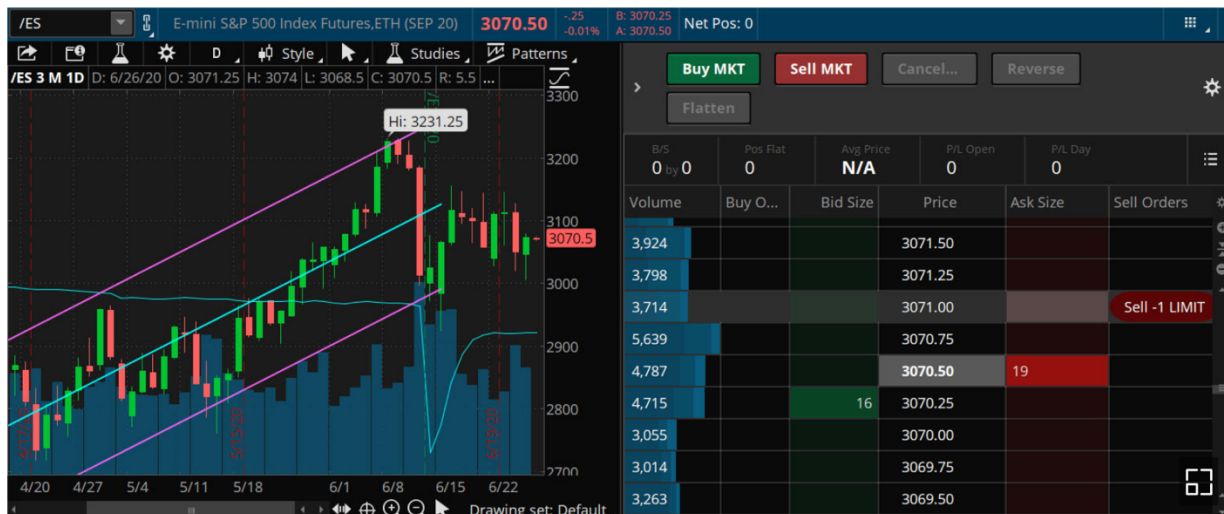


Figure 2 TD Ameritrade's Thinkorswim Trading Application

327. These retail brokerage applications often incorporate software that provides technical indicators or other strategy-based measures for retail investors. Professional and

institutional investors, on the other hand, do not rely on brokerage applications to develop or execute trading strategies, but instead rely on direct interfaces between their own bespoke software and their brokerages not only to monitor prices, but to make trades.

328. Retail order flow is produced uniquely by retail investors. It is generally produced through brokerage trades that are routed by contract to market makers and internalizers. In fact, this order flow's value is derived by the closed system in which trades are executed, as brokerages often contractually guarantee that trades will first be routed to market makers before reaching open exchanges for fulfillment (as a last resort).

329. ***Distinct customers / consumers.*** The consumers of retail order flow in the ROFM are retail broker-dealers. These broker-dealers are paid large amounts of money for order flow they acquire from retail investors, and remit to a retail investor as part of a trade some amount of this payment, whether through a rebate, price improvement, or some combination of the two.

330. Other consumers of order flow, such as prime brokers and securities exchanges, do not seek or segment order flow to isolate retail or individual investors.

331. The top firms that acquire retail order flow from individual investors are distinct and defined. The largest of these are TD Ameritrade, Robinhood, E*Trade, Charles Schwab, Webull, and Fidelity.

332. The firms—market makers and internalizers—that pay retail brokers for their clients' order flow are also distinct and defined. The largest of these are Citadel, Virtu Americas, Two Sigma Securities, Wolverine, Global Execution Brokers, Dash Financial, UBS Securities, Jane Street, and G1 Execution Services.

333. ***Distinct prices and sensitivity to price changes.*** The price paid to producers of retail order flow in the ROFM—individual and retail investors—is distinct. In the case of a zero-commission broker, the price paid by a retail broker for an individual investor's order flow is the

amount of the broker's payment for order flow that is remitted to the retail client as part of a trade, either as a rebate, as price improvement, or some combination.

334. Other securities brokerage services markets generally charge different prices. Prime Brokerages, for example, which cater to hedge funds and financial institutions, impose service charges and commissions for trades.

335. Because these brokers generally route trades to venues determined and directed by their clients, the client is aware of any rebate or payment received for their orders, and those rebates are generally remitted to the client. The price of their services therefore do not depend on the amount of a payment for order flow that is passed on to them.

336. In addition, retail investors pay higher transaction costs in the form of bid-ask spreads, which are significantly wider for retail investors than non-retail investors. The bid-ask spreads for options are even higher than for institutional investors.

337. This is largely because retail trades are fulfilled by market makers and other off-exchange internalizers that benefit from higher spreads—in fact, that base their entire business models on imposing higher spreads on retail investors. Others who buy and sell securities outside of the ROFM generally benefit from more efficient securities markets, including through narrower spreads.

338. Finally, price discovery mechanisms for retail investors in the ROFM are significantly different than for other securities traders. Because almost all of retail orders never make it to exchanges, they are generally fulfilled without price publication.

339. The spreads, including profit margins obtained by the market makers trading against retail investors, are not publicly known and cannot be known *a priori* by retail traders. Those spreads are, however, clearly significant, as they are the primary source of profits for market makers, who pay large amounts of money for the order flow they trade against. These profits come

almost entirely from trading against retail investors, including by charging them more for securities than available to other market participants.

340. *Specialized vendors.* In addition to specialized broker-dealers, such as Schwab and TD Ameritrade, that cater to retail investors, other specialized vendors have emerged that cater almost exclusively to retail investors.

341. For example, specialized websites provide research to individual investors. These websites include fool.com (The Motley Fool) and thestreet.com. Many of these websites charge subscription fees and directly target retail investors.

342. In addition, there are television programs directed entirely towards small or retail investors. For example, Jim Cramer's "Mad Money," which airs on CNBC, is designed to provide investment research and stock picks to individual and retail investors.

343. Jim Cramer also sells "trade alerts" to individual investors, as well as other research through thestreet.com.

344. Other shows, such as "Options Action" on CNBC, also cater to individual options investors. They generally provide market commentary and platforms for analysts. Institutional and other distinctly sophisticated options investors do not generally rely on such a television show to price options or to make options purchases.

345. Research targeted at individual investors is generally considered by sophisticated market participants as either untimely, inferior, or based on information uncorrelated with market prices. Sophisticated and institutional investors do not generally rely on websites or television shows to make securities purchases.

346. Such research and analysis is generally provided to encourage frequent trades by retail investors or to charge subscription fees. These vendors are distinctly tailored for retail investors, who generate the trades in the ROFM.

C. The Relevant Geographic Market

347. The relevant geographic market is the United States.

348. This is a consequence of regulatory barriers regarding the sale of securities to U.S. persons and individuals in the United States.

349. For example, the Securities Exchange Act of 1933 generally requires, among other things, registration of a security before it can be publicly traded in the United States.

350. There are distinct exemptions to the sale of securities without registration, but those exemptions generally apply to high-net-worth individuals and sophisticated traders, not the individual and small investors that make trades in the ROFM.

351. Moreover, retail brokerages generally require funds to be held in the United States in order to be credited to brokerage accounts. Thus, foreign accounts cannot generally be used to fund retail brokerage accounts used by individual and retail investors to invest in U.S. markets.

352. In addition, funds used to trade in the ROFM through retail brokerages are subject to banking and other regulations, which generally require verification that the funds are in the United States and held by U.S. persons or individuals authorized to transact in the United States.

353. Because NBBO prices are generally measured through trades on U.S. exchanges, such as the New York Stock Exchange, transactions in the ROFM generally occur in the United States in order to permit minimal, trivial, or *de minimis* price improvement measured against the NBBO—a measure well-known to be stale and therefore able to be arbitrated against.

354. Finally, many other jurisdictions simply do not allow payment for order flow. For example, payment for retail order flow is generally banned in Canada and the United Kingdom. In the European Union, payment for order flow is heavily regulated under a distinct and more onerous set of rules and laws, under a regulatory framework that includes far more scrutiny and significantly greater disclosure requirements than in the United States.

D. Barriers to Entry

355. The ROFM is protected by powerful barriers to entry that prevent meaningful entry by new retail broker-dealers, who would in turn compete with existing brokers by remitting to retail investors as part of a trade a larger share of the payment for order flow obtained from market makers / internalizers.

356. To begin with, there is a substantial regulatory barrier to entry surrounding the ROFM. To serve as a broker-dealer that could purchase order flow from retail investors to sell to market makers, a broker-dealer must comply with substantial regulatory requirements, including registration with the Securities Exchange Commission.

357. Individual brokers are also required to be licensed to serve as brokers, including through various “Series” examinations.

358. Broker-dealer firms must register with self-regulating organizations (“SROs”) such as the National Association of Securities Dealers (NASD), which also imposes its own set of rules, regulations, and enforcement systems on broker-dealers.

359. Broker-dealers also must follow exchange rules. They are also subject to fiduciary duties to their clients and laws, including varying state laws, that impose various common law and statutory duties on them.

360. Broker-dealers must also provide detailed disclosures, including all material facts relating to their customer relationships. Statements construed as recommendations by broker-dealers must also be accompanied by substantial disclosures governed by complex SEC rules and guidance provided by the SEC’s Office of Compliance Inspections and Examinations (“OCIE”).

361. Another barrier to entry surrounding the ROFM is switching costs. Setting up a brokerage account generally requires the funding of an account as well as know-your-customer hurdles. Retail investors will generally not switch brokers without a significant incentive to do so.

These high switching costs solidify the positions of existing market participants, including TD Ameritrade and Schwab.

362. The ROFM is also protected by aggregation effects. Broker dealers with larger client bases and larger amounts of retail order flow are valued more than those that do not. A competing broker-dealer must first obtain a critical mass of order flow before it can successfully enter at competitive scale with existing market participants.

363. The ROFM has generally seen few entrant broker-dealers, who purchase order flow from retail investors such as Plaintiffs and members of the Class. Indeed, the most recent entry into the ROFM was by Robinhood Securities, which had a significant first-mover advantage, having been the first firm to base its entire business model on order flow payments rather than commissions. There have been no major entrants since all of the major retail broker-dealers transitioned to a payment-for-order-flow business model.

364. A new entrant must also develop software applications, including mobile apps, that cater to individual investors, who do not have access to professional trading systems and software. Without software that reduces trading friction and that provides a polished user interface, a new entrant is unlikely to obtain sufficient order flow (*i.e.*, shares traded) in the ROFM from retail investors, particularly given switching costs created by individual investors' familiarity with a particular broker-dealer's software interface.

365. Another barrier to entry is the data from retail order flow. Because market makers and internalizers trade against retail investors, they need a substantial amount of data of a form and quality that permits the market maker to (a) segment the order flow they receive by sophistication, and (b) to profitably trade against retail investors who produce order flow in the ROFM. And because there are zero commissions for retail broker-dealers, the data they generate to sell to market makers must generate similar levels of payment for order flow provided to existing

retail broker-dealers, or a new entrant will not be able to successfully compete. This means that a new retail broker-dealer entrant must enter at significant scale, with significant technological knowhow and trade-generation capability, to immediately generate retail order flow data of competitive quantity, cleanliness, and format to existing retail broker-dealers.

366. In practice, entry to the ROFM requires that a broker successfully sell customer order flow data to one of a small handful of dominant market makers / internalizers, such as Citadel, Virtu, and Two Sigma. Existing retail brokers already have close relationships and history with these necessary counterparties, including knowhow and technical systems set up to provide the precise format and aggregated quantities of retail order flow data that individual dominant market makers / internalizers need for their bespoke machine learning / AI models and systems. A new entrant to the ROFM would have to compete against a handful of legacy brokerages that each have substantial market maker-specific experience, knowhow, and existing contracts and relationships. Notably, the market maker / internalizer aspect of the ROFM itself has substantial barriers to entry, such that a new market maker / internalizer who seeks to compete with the presently-dominant market maker firms (*e.g.*, Citadel, Virtu, Two Sigma) would have to quickly train machine learning / AI models at scale on large quantities of high-quality, fresh retail order flow data; develop significant data infrastructure to update and retrain such models based on new, fast-moving data; and purchase sufficient mathematical computing power, including GPUs or Tensor Processors (“TPUs”), to train these models. All this is non-trivial, and the barriers to entry in the adjacent market maker / internalizer market further entrenches the dominance of existing firms in the ROFM, which have substantial ongoing experience and relationships with the dominant market makers / internalizers like Citadel, Virtu, and Two Sigma.

367. Finally, because most retail brokerages sell their clients’ orders to market makers, trade execution services are generally commoditized, creating high marketing costs. A new entrant

must therefore spend large amounts of money to market directly to retail investors, including through television ads, online ads, and other forms of advertising likely to reach the retail segment. In addition, marketing efforts must increase trade volume on a per-client basis, maximizing the per-share order flow payments received upon entry.

XI. THE MERGER SUBSTANTIALLY LESSENED COMPETITION, INJURING PLAINTIFFS AND THE CLASSES

368. The merger between TD Ameritrade and Schwab substantially lessened competition in the ROFM in several ways.

A. The Merger Reduced Price Competition in a Highly Concentrated Market

369. Retail investors are the producers of order flow in the ROFM. Retail brokers provide services, including rebate/price improvement remittances, that induce retail investors to make trades with them, which generates valuable retail order flow that retail brokers sell to market makers / internalizers, who fulfill the trades. Some portion of the payment for order flow received by retail brokers is remitted to retail investors as a part of each trade; retail brokers compete for retail investors' business based, in part, on that remittance.

370. Retail brokerages have reduced commission charges to zero, eliminating upfront costs. That does not, however, mean that investors obtain trade executions for free. To the contrary, retail investors' order flow has value and is provided to broker-dealers in exchange for trade fulfillment and remittance of some or all of the payment for order flow to the individual investor as part of a trade—either through a rebate, through price improvement, or through some combination of these.

371. A primary determinant for price in the ROFM is therefore the amount of payment for order flow that is remitted to the retail investor as part of a trade. The price of a retail investor's order flow for a trade is the amount of payment for order flow remitted to that investor through

rebate and/or price improvement as part of a trade; the broker-dealer keeps the rest. A retail investor will, all other things being equal, seek to execute a retail trade with a broker that remits a higher portion of the payment for order flow to investors, whether through higher rebates, better price improvement, or some combination of both. This is an important way—perhaps the most important way—that retail brokerages compete with one another to obtain retail order flow in a zero-commissions market.

372. Retail brokerages compete with each other to obtain retail order flow from individual investors. The Merger resulted in a significantly higher market concentration in the ROFM, which in turn reduced the competition among retail broker-dealers to remit higher amounts of payment for order flow to clients through rebates and/or price improvements. This harmed Plaintiffs and the Class Members, who suffered an out-of-pocket loss because the money they would have received through rebates and/or price improvements for trades in the ROFM was anticompetitively lessened.

373. The merged TD Ameritrade and Schwab now control approximately half of all retail order flow in the ROFM. As a result of the Merger, fewer firms compete with each other in the ROFM on the amount of payment for order flow remitted to retail investors, including Plaintiffs and the Class Members.

374. In addition, transaction costs increased as a result of the Merger, because a larger amount of the retail order flow in the ROFM is now in the hands of the Merged Firm. This ensures that at least half of all order flow is fulfilled in the first instance off-exchange, meaning that market makers can profit by trading against the order flow with little competition. This also creates a negative feedback loop in transaction costs: more order flow being fulfilled off-exchange contributes to an increasingly stale NBBO price (which is calculated from exchange trades); an increasingly stale NBBO price increases profits from market makers who seek to trade against

retail investors' trades; as a result, market makers pay more money to draw even more retail order flow from exchanges; and the loop repeats. This is not the natural order of things, but an unstable equilibrium—one intentionally created by a handful of dominant retail brokers in the ROFM and a handful of dominant market makers / internalizers adjacent to it. The merger reduced the number of retail brokers in the ROFM, which made it easier to preserve and expand this unstable equilibrium (which harms retail investors, including Plaintiffs and the Class Members).

375. The overall cost to trade, meaning the all-in costs of produce trades in the ROFM, have increased for retail investors like Plaintiffs and the Class Members as a result of the Merger. In particular, the lessening of competition in the ROFM has led to smaller remittances from payment for order flow to retail investors, including Plaintiffs and the Class Members. In short, Plaintiffs and the Class Members, who all make retail trades and produce retail order flow in the ROFM, have come away from their trades with less money than they would have but for the Merger.

B. The Merger Reduced Retail Investor Choice in the Retail Order Flow Market

376. Because of the substantial increase in market concentration resulting from the Merger, retail investors have fewer choices as to retail brokers.

377. Moreover, because the Merged Entity obtains profits almost entirely by collecting order flow payments for the trades generated by its clients, retail investors are subjected to increased transaction costs in the form of anticompetitively depressed remittances from their trades.

378. Retail investors are further provided with a diminished choice, as they are not permitted by the Merged Entity to opt out of the payment for order flow model, including by paying for services through commissions.

379. Retail investors are also captured by market makers and internalizers that have contracted with TD Ameritrade and Scwab for order flow, meaning that they lack control over how their trades are executed and cannot in the first instance require a trade to occur on an open exchange.

380. The Merger also reduced the number of options aggregators available, increasing the likelihood that an affiliate of an aggregating entity can trade against the retail investors in the equities options market.

C. The Merger Facilitates Market Inefficiency and Higher Transaction Costs for Retail Investors

381. The Merged Entity constitutes approximately half of all retail trades in the ROFM, meaning that market makers need not contract with numerous firms to obtain a substantial portion of all retail order flow.

382. Indeed, the Merged Entity is a one-stop shop for market makers to obtain a significant (and critical mass) of retail order flow. This reduces the incentive to increase payments for order flow in the market generally, as capturing the order flow from TD Ameritrade and Schwab at once results in obtaining approximately half of all trades produced in the ROFM.

383. The Merged Entity alone can provide a market maker that uses AI and machine-learning models approximately half of the retail order flow data available in the ROFM. This provides market makers with information asymmetries that increase the costs of transacting in equities and equity options.

384. After the Merger, market makers, particularly Citadel, can control a large segment of all trades from the ROFM without having to contract with several entities, in turn allowing it and other market makers to profit in excess of the amount per share paid for order flow. This

amount is far larger for most trades on a per-share basis than the spread between the transacted price and the NBBO price.

385. Overall, the Merger therefore resulted in higher spreads than would otherwise exist, less payment for order flow remitted to retail customers as part of their trades, and higher information costs resulting from the lack of price transparency inherent in mandatory off-exchange order fulfillment.

D. The Merger Significantly Strengthened Barriers to Entry

386. The Merger significantly strengthened the barriers to entry surrounding the ROFM.

387. First, the Merger resulted in a larger aggregation of retail investor order data, which increases the edge obtained by market makers who buy order flow from the Merged Entity—namely, by obtaining data that can be used to train AI or machine learning models.

388. Because the Merged Entity controls approximately half of all of the retail order flow for which payments are made in the ROFM, a market maker obtains a critical mass of retail investor data by contracting with the Merged Entity.

389. This critical mass of retail investor trading data increases the informational advantage and asymmetry enjoyed by the Merged Entity, making entry more difficult for a potential entrant. A new entrant must obtain a significant amount of the other half of the retail investor trades to successfully enter the ROFM.

390. Control over half of the payments made for retail order flow also creates a feedback loop, providing a market maker purchasing the order flow from the Merged Entity with an information advantage that can be used to obtain more profits, allowing market makers to secure more order flow data by purchasing additional order flow.

391. The Merger also standardizes a larger segment of the ROFM's retail investors on the software and applications provided by TD Ameritrade or Schwab, increasing switching costs

and solidifying network effects that result from user interfaces and functionality provided by their software. In other words, a trader is unlikely to switch to a new entrant's retail brokerage because it would require learning to transact using different software and a different user interface.

392. The Merger also locks in a greater number of trades into an off-exchange ecosystem, meaning a new entrant cannot compete with other market makers for order flow on an open and transparent market.

393. The Merger also reduces incentives for market makers to purchase retail order flow from a new entrant, as the Merged firm provides access to approximately half the trades subject to payment for order flow.

394. The Merger also results in a perverse incentive to provide lower quality research and trading services, as the value of the order flow increases with the lack of sophistication and the information asymmetry of retail investors. This means a new entrant could not obtain market share by providing superior information to retail investors, as that would reduce its ability to sell its order flow to market makers, who seek unsophisticated and uninformed order flow.

E. The Merger Eliminated Conflict-of-Interest Safeguards, Reducing the Efficiency of the Retail Order Flow Market

395. Payment for order flow is rife with conflicts of interest, which are mitigated by competitive forces among the broker-dealers and among the market makers that purchase retail order flow from those broker-dealers.

396. In a competitive market, market makers compete with each other to obtain order flow from retail brokerages, incentivizing higher payments per share traded in the ROFM. Then, competition among broker-dealers provides an incentive to remit an increased share of this payment for order flow to retail investors as part of each trade, whether through a rebate, through price improvement, or through some combination of the two.

397. The Merger disrupted both of these competitive forces. With respect to market makers, they are able to capture a large percentage of the retail order flow generated in the ROFM by contracting with the Merged Entity, rather than separate entities. Market makers thus face less pressure to increase payments for order flow in order to capture more trades from a less concentrated set of retail brokers.

398. With respect to retail investors, the increase in retail broker market concentration from the Merger reduces the incentive among broker-dealers to compete with each other on price, namely by remitting larger shares of payment for order flow to retail investors as part of trades, either through rebates, through price improvements, or through a combination.

399. After the Merger, the conflict of interest inherent in payment for order flow therefore became more powerful. Retail brokers other than the Merged Entity have less power to negotiate larger payments from market makers, and there are fewer retail brokers to compete for retail investor trades, meaning higher all-in transaction costs and prices for trade execution.

400. Additionally, the increased concentration in the ROFM provides fewer opportunities for retail brokers to send retail trades to exchanges rather than market makers, which further contributes to the staleness of the NBBO, creating a vicious circle that harms retail investors, such as Plaintiffs and the Class Members.

F. The Merger Reduced Price Transparency for Retail Investors Who Generate Order Flow in the Retail Order Flow Market

401. The Merger reduces price transparency for trade executions. Unlike in a normal market where trading prices, as well as spreads, are published by an exchange, market makers do not disclose the profits they obtain from the retail order flow they trade against.

402. Because of the Merger, retail brokers have less incentive and ability to obtain information about trades made against their clients by market makers, including about strategies employed by market makers and profit margins.

403. In addition, because the Merger results in a larger aggregation of trading data, market makers, including Citadel, are capable of training more sophisticated and powerful machine-learning and AI models.

404. These models are generally black boxes, including to their designers, meaning that retail brokers are unable to determine how the models make decisions in part because the market makers themselves lack transparency into their model's workings. Indeed, fully trained deep neural networks make decisions that are opaque to their trainers and operators, meaning that apart from examining profit margins, it is difficult to determine how the models are handling trade executions and trades against retail investors.

405. This opaqueness is significant enough for market makers, but it is even more significant for retail brokerages. By concentrating a critical mass of retail order flow, the Merged Entity increases the viability, profitability, and power of opaque machine learning and AI models used by market makers, further increasing the opaqueness of how the market makers trade against retail investors and the true extent of price improvement achieved by the broker-dealers.

406. The net effect is that the retail brokers do not safeguard the interests of the retail investors beyond a trivial and meaningless comparison to the NBBO price. Indeed, the Merged Entity, as well as other market participants in the ROFM, do not disclose the trading strategies or profit margins employed by the market makers fulfilling the orders of their retail clients. This is in many cases because the brokers do not know that information or do not even try to obtain that information. In short, the Merger made it more difficult to obtain and disclose such information.

G. The Merger Resulted in a Quantitatively Measurable Harm to Competition

407. Before an order makes it to the stock exchanges and the open market, a broker-dealer routes its clients' orders through market makers, who then fulfill the orders internally. Orders fulfilled by market makers are never reported on the exchanges, and the transaction prices and volumes are not reflected among the exchange's transactions. For dominant market makers and retail brokers, including Defendant, this is a feature, not a bug.

408. A broker-dealer, which routes its retail clients' orders to the market makers, attempts to show "price improvement" with respect to the NBBO price to comply with regulatory and fiduciary requirements. However, since the NBBO price does not reflect internalized orders by market makers, the NBBO is made increasingly stale the more orders are served off-exchange by market makers. The more stale the NBBO is, the more it becomes an artificial hurdle for "price improvement"—and an opportunity for market makers to profit by trading against retail orders.

409. A stale NBBO—which is, again, caused and exacerbated by diverting retail order flow off-exchange, such that transactions aren't reflected in the NBBO—allows the market makers to profit by trading against the retail orders flow those market makers service, while the broker-dealer that provides the market makers with retail order flow in exchange for payment is able to claim a wholly illusory "price improvement" to clients and regulators.

410. If the NBBO price reflected all transactions among market makers, there would be little opportunity for market makers, such as AI-driven hedge funds, to profit from retail investors' order flow, as the NBBO price would accurately reflect prevailing prices. Put simply, to profit from retail order flow while maintaining the regulatory fig leaf of NBBO-defined "price improvement," market makers must ensure retail trades never reach the exchanges.

411. From January 2020 until the present, TD Ameritrade, Inc., its clearing company, TD Ameritrade Clearing, and Schwab prevented retail trades from ever reaching exchanges, such

as the Nasdaq. According to public disclosures by Schwab and TD Ameritrade, the companies routed almost all retail market orders for S&P 500 stocks to internalizers. Schwab, for example, disclosed that from January 2020 through the first quarter of 2022, it consistently routed none of its market orders for S&P 500 stocks to the Nasdaq exchange for fulfillment. This ensures that the NBBO price remains stale—never reflecting actual trades by retail investors.

412. Maintaining a stale NBBO price is an essential part of keeping payment for order flow a viable business model. If the NBBO price began to reflect actual prices paid by retail investors, the manufactured “price improvement” regulatorily required of Defendants to sell order flow to market makers would disappear.

413. In that situation, there would be little difference between a real-time and accurate NBBO and the execution prices for trades routed to market makers. Without some showing of price improvement, brokers could not justify—even thinly—the routing of retail orders to market makers in exchange for payments.

414. If any market maker defects and begins routing trades to the exchanges, the prices for those trades would be reflected in the NBBO, increasing price transparency and diminishing the ability of other market makers to show a manufactured “price improvement.”

415. In other words, the stale NBBO is the product of an unstable equilibrium, which is an equilibrium that may disappear, shift, or significantly change upon perturbation.

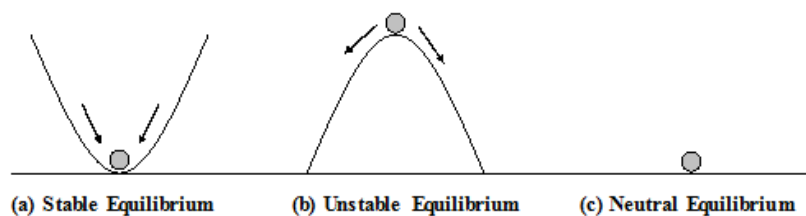


Figure 1 – Three Types of Equilibria

416. The NBBO price remains stale as long as market makers and broker-dealers prevent orders from reaching the open markets. If a broker-dealer routes trades to the exchanges, the NBBO price would be less stale.

417. If a critical mass of orders are routed to the exchanges by a broker-dealer, the ability of other market makers to profit from payment for order flow collapses. In such a case, there is no stale NBBO to arbitrage for profit, and there is no “price improvement” justification to which a broker-dealer can point.

418. Because a broker-dealer seeking the best price for its client may route a trade to an exchange, thereby affecting the NBBO price, market makers must ensure that they offer the greatest incentive to route trades exclusively to them. The fewer market maker options, the less competitive market makers’ prices need be, and the more reliably stale the NBBO price remains.

419. The Merger directly resulted in a measurable power transfer to two of the market makers—Citadel and Virtu. A mathematical and statistical analysis of the routing allocations among market makers for Schwab, TD Ameritrade Inc., and TD Ameritrade Clearing, Inc. demonstrates this effect.

420. Each broker discloses the share of orders routed to market makers in an SEC Form 606, which provides quarterly figures. Among the disclosures are routing shares, which are the percentage of various types of orders that are routed to each market maker. For example, Charles Schwab disclosed that in January of 2020, its clients’ orders were routed to Citadel 31.87% of the time and to Virtu 30.4% of the time for S&P 500 stocks.

421. The disclosures of market orders (orders that are designated by the client to be executed at prevailing market prices) when analyzed, show that allocation shares among to market makers became less dynamic and more strongly controlled by Citadel and Virtu after the Merger than before.

422. A simple mathematical analysis shows the quantitative impact of the Merger on the allocation of trades among market makers.

423. First, each month-by-month share of orders for each market maker can be piecewise measured for their covariance with each other. Covariance is defined as:

$$cov_{x,y} = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{N - 1}$$

424. This metric takes the market allocation percentages for one market maker during a period and finds how the two market allocations vary with each other.

425. The covariance provides the direction of the effect—positive, meaning that the routing shares correlate together, and negative, meaning that they correlate inversely. But, the metric does not accurately reflect the magnitude of the correlations. As such, the covariance is transposed into the correlation coefficient among routing shares.

426. The correlation coefficient is defined as the co-variance divided by the standard deviations for each market maker's allocation share during a period. The correlation coefficient can be generalized as follows:

$$\rho_{xy} = \frac{\text{Cov}(x, y)}{\sigma_x \sigma_y}$$

427. This metric provides information about both the direction of the correlation between allocation shares and the magnitude of the correlation. Each piecewise correlation can then be placed into an $n \times n$ matrix, called a correlation matrix.

428. For example, the correlation matrix for Schwab's trade routing for S&P 500 market orders among the market maker entities affiliated with Citadel, Virtu, UBS, G1 Execution, and

Two Sigma, can be represented as follows for the period before and after the Merger was announced in October 2020:

Pre-Merger

$$\begin{pmatrix} 1 & -0.0982003 & 0.0500617 & -0.283578 & 0.27576 \\ -0.0982003 & 1 & -0.509114 & 0.515362 & -0.606142 \\ 0.0500617 & -0.509114 & 1 & -0.0735776 & -0.243287 \\ -0.283578 & 0.515362 & -0.0735776 & 1 & -0.766403 \\ 0.27576 & -0.606142 & -0.243287 & -0.766403 & 1 \end{pmatrix}$$

Post-Merger

$$\begin{pmatrix} 1 & 0.516891 & -0.901789 & 0.167858 & -0.0945443 \\ 0.516891 & 1 & -0.425841 & 0.461277 & 0.557984 \\ -0.901789 & -0.425841 & 1 & -0.0172459 & 0.251128 \\ 0.167858 & 0.461277 & -0.0172459 & 1 & 0.735289 \\ -0.0945443 & 0.557984 & 0.251128 & 0.735289 & 1 \end{pmatrix}$$

429. The eigenvalues and eigenvectors of the matrices corresponding to the periods before and after the Merger provide information about how much each of the market makers contributed to the distribution of routing shares before and after the Merger.

430. The eigenvalues of the pre- and post-merger correlation matrices for Schwab, TD Ameritrade Clearing Inc., and TD Ameritrade, Inc., S&P 500 market orders show a direct effect on routing distributions resulting from the merger.

431. For Schwab, the correlation matrix eigenvalues attributable to the top two market makers, Citadel and Virtu, increased dramatically, from 3.71823 pre-Merger to 4.3622 post-Merger (an approximately 17% increase). Correlation matrix eigenvalues for other market makers were distant, with the next three market maker correlation matrix eigenvalues falling well behind at 0.434714, 0.120143, and 0.0829382, post-Merger.

432. For TD Ameritrade Clearing, Inc., the same effect was measured for S&P 500 market orders. The eigenvalues attributable to the top two market makers, again Citadel and Virtu,

increased dramatically from 3.36052 pre-Merger to 3.96016 post-Merger (an approximately 18% increase), with allocation correlation matrix eigenvalues for the next three market makers falling well behind at 0.68, 0.31, and 0.04.

433. TD Ameritrade Inc. routed only to three market makers during the relevant period, Virtu, Citadel, and Two Sigma. Before the Merger, Citadel's covariance eigenvalue was 1.97485, increasing to 2.17234 post-Merger, an approximately 10% increase. Post-merger correlation matrix eigenvalues for Virtu and Two Sigma contributed significantly less, at 0.827656 for Virtu and a negligible 1.62469×10^{-6} for Two Sigma.

434. This analysis shows that for each of the Defendants' broker-dealer entities that controlled routing to market makers, routing decisions shifted post-merger, consolidating trades in the hands of Citadel and Virtu. The correlation matrix analysis provides measurable insight into the principal components of the trade allocations among market makers before and after the Merger.

435. Put simply, Citadel and Virtu became far stronger players after the Merger, with Schwab, TD Ameritrade Clearing, Inc., and TD Ameritrade Inc. concentrating their routing of trades to the two market makers.

436. The net effect of this shift after the Merger is that the unstable equilibrium that keeps the NBBO price stale becomes less susceptible to perturbation—that is, it becomes more stable.

437. Together, Virtu and Citadel can ensure that almost all retail orders are fulfilled without ever reaching the exchanges. This, in turn, diminishes the likelihood of defection by any other broker dealer as to routing decision, particularly given the Merged Entity's approximately 50% combined share of retail order flow.

438. In other words, if Citadel and Virtu capture the Merged Entity's order flow, they have netted a critical mass of retail trades, which in turn reduces the risk that another competing broker-dealer will route a critical mass of retail trades to exchanges. All of this allows the broker-dealers and the market makers to keep the NBBO stale.

439. The quantitatively measurable effect of the Merger is that Citadel and Virtu obtained a greater stranglehold over retail order flow, and did so because they needed only to reach an agreement with just one large broker—the Merged Entity—rather than several broker-dealers competing on behalf of their clients for greater payment for order flow and price improvement.

440. The market makers competed less; Citadel and Virtu gained substantially more control over the available retail order flow; and the likelihood of a broker-dealer other than the Merged Entity defecting and thereby improving the stale NBBO substantially diminished.

H. There Are No Significant Pro-Competitive Effects from the Merger

441. Although, like with most mergers, the Merged Entity may have obtained some synergies from the Merger, such synergies, as well as the increase in market share in the ROFM, did not inure to the benefit of competition in the ROFM.

442. For example, the Merger created significant duplication in software platforms among the two retail brokerages, creating an incentive to eliminate software features being competitively developed by each of the firms prior to the Merger.

443. The Merger's resultant increase in market concentration has not reduced transaction costs, increased the quality of services for retail investors, or increased the share of order flow payments remitted to retail investors as a part of their trades in the ROFM.

444. The Merger has not increased the amount of order flow payments per share remitted to retail investors, either through rebates, through price improvements, or both. The Merger has not increased the value of trade execution services for retail investors.

445. The Merger has also decreased competition among market makers, as obtaining order flow from the Merged Entity results in ensuring that almost all retail trades occur off exchange, increasing the ability to profit by buying retail order flow and further contributing to the staleness of the NBBO, creating a vicious circle that harms retail investors in the ROFM.

446. The Merger has not resulted in any material increase in per-share amounts paid to investors for retail order flow in the ROFM. The Merger has also failed to lower spreads, nor has it increased the transparency of transaction costs, including as to the amount of value extracted by market makers by capturing—and trading against—retail investor order flow.

447. Put simply, the Merger has not resulted in *any* meaningful procompetitive benefits in the ROFM—and certainly no procompetitive benefits that could feasibly be said to outweigh the substantial anticompetitive effect of the Merger.

I. Plaintiffs and the Class Members Have Suffered Antitrust Injury

448. Plaintiffs and the Class Members have suffered antitrust injury—*i.e.*, injury that the antitrust laws are meant to protect against—as a result of the Merger.

449. *First*, Plaintiffs and the Class have paid higher all-in transaction costs in their retail trades as a result of the merger. Plaintiffs and the Class Members have obtained smaller payment for order flow remittances from their brokers (*e.g.*, rebates, price improvement, or both) as part of their trades than they would have absent the Merger, were they customers of separately-run Schwab or TD Ameritrade firms.

450. Absent the Merger, increased price competition would have permitted Plaintiffs and Class Members to capture a greater amount of the payment for order flow provided to the retail brokers as per-trade remittances in the form of rebates and/or additional price improvement. However, the Merger reduced competition in the ROFM significantly enough that Plaintiffs and

the Class were (and continue to be) per-share underpaid for the equities and options trades they have made since the Merger.

451. *Second*, Plaintiffs and the Class Members suffer from diminished choice in how they obtain trade executions in exchange for their order flow. Plaintiffs and the Class Members are not able to opt out of the payment for order flow business model, as the Merger has reduced the competitive forces that would create a competing commission-based trading business model. Plaintiffs and the Class Members cannot opt out of having their order flow sold to market makers, and they cannot control where their trades are executed in the first instance.

452. This last inability—the inability of Plaintiffs and the Class Members to control where their trades are executed in the first instance as a result of diminished choice engendered by the Merger—has a further injurious (and self-reinforcing) effect. The NBBO, which is supposed to protect Plaintiffs and the Class Members from conflicts of interest regarding payment for order flow, is notoriously stale enough that it is used to profitably trade against Plaintiffs and the Class Members by market makers and internalizers. However, by collusively preventing Plaintiffs and the Class Members *en masse* from requiring their orders be routed through exchanges, brokers and market makers ensure that the NBBO (which depends on public trades for its signaling value) ***will continue to remain problematically stale***. By reducing the number of broker firms in the ROFM and consolidating one-half of all retail order flow in the Merged Entity, the Merger has anticompetitively persisted this unstable—but injurious—equilibrium whereby no broker sends any serious quantity of retail order flow to the markets, thus ensuring the NBBO remains stale and that market makers can continue to profitably trade against the same retail investors that are prevented from sending their order flow to an actual exchange.

453. *Third*, Plaintiffs and the Class Members suffer from less transparency as to the transaction costs associated with their trades. Because the Merged Entity possesses a critical mass

of retail order flow data, which it sells to market makers, the Merger has increased the power of the machine learning and AI models the market makers use to trade against the retail investors that generate the order flow. Moreover, because of the increase in retail order flow data aggregation, the viability of opaque machine-learning and AI models that require large amounts of information has increased, reducing the transparency for retail investors as to their all-in transaction costs.

454. Relatedly, the Merger has resulted in less disclosure / no disclosure by the retail brokers as to the trading strategies imposed by the market makers executing the trades. Indeed, the Merger has reduced the retail brokers' ability to police conflicts of interest arising from market makers both executing trades and trading on their own behalf against retail investors of the Merged Entity.

455. *Fourth*, because of the Merger, customers of Schwab and TD Ameritrade—including Plaintiffs and the Class Members—are disadvantaged as to the price spreads obtained from the market makers. Because market makers, including Citadel, Virtu, and Two Sigma, profit by obtaining a trading advantage against retail investors in excess of the amount they pay the retail brokers for retail order flow, retail investors like Plaintiffs and the Class Members obtain poorer prices and trade with wider spreads than they would have absent the Merger.

456. Schwab and TD Ameritrade made more than billion dollars from order flow payments last year, meaning that the market makers necessarily made more money, as they have reported increased profits since the Merger in their market making businesses.

457. Plaintiffs and the Class Members are entitled to damages in the form of the amount of retail order flow payments received by their brokers that would have been remitted to clients as rebates, price improvement, or some combination of both, but for the anticompetitive Merger.

458. Plaintiffs and the Class Members require injunctive relief to remedy the antitrust injury they have sustained due to the Merger, including to remedy their inability to control trade executions and how they pay for trade executions.

459. Plaintiffs and the Class Members require injunctive relief to prevent further antitrust injury going forward from the Merger, including an appropriate divestiture or segregation order meaningfully separating the pre-merger TD Ameritrade and pre-merger Schwab lines of business.

CLASS ACTION ALLEGATIONS

460. The Class's claims all derive directly from a course of conduct by Defendant. Defendant has engaged in uniform and standardized conduct toward the class.

461. Defendant did not materially differentiate in its actions or inactions toward members of the class. The objective facts on these subjects are the same for all Class members.

462. Within the Claim for Relief asserted by the Class, the same legal standards govern. Accordingly, Plaintiffs bring this lawsuit as a class action on their own behalf and on behalf of all other persons similarly situated as members of the proposed class pursuant to Federal Rules of Civil Procedure 23(a) and (b)(3) and/or (b)(2) and/or (c)(4).

463. This action satisfies the numerosity, commonality, typicality, adequacy, predominance, and superiority requirements of those provisions.

The Retail Brokerage Client Class

464. Plaintiffs bring this action and seek to certify and maintain it as a class action under Rules 23(a); (b)(2); and/or (b)(3); and/or (c)(4) of the Federal Rules of Civil Procedure on behalf of themselves and a Class defined as follows:

All persons, entities, and/or corporations in the United States who purchased or sold equities or equity options through TD Ameritrade,

Schwab, or any of their affiliates from October 26, 2020, through the present.

465. Excluded from the Class are Defendants, their employees, officers, directors, legal representatives, heirs, successors, and wholly or partly owned subsidiaries or affiliates; and the judicial officers and their immediate family members and associated court staff assigned to this case.

Numerosity and Ascertainability

466. Each class in this action satisfies the requirements of Fed. R. Civ. P. 23(a)(1). Thousands of persons, entities, and/or companies nationwide purchased brokerage services from Defendant, its subsidiaries, and affiliates. Individual joinder of all Class members is impracticable.

467. The Class is ascertainable because its members can be readily identified using brokerage accounts and other information kept by Defendant and/or third parties, including market makers, in the usual course of business and within their control.

468. Plaintiffs anticipate providing appropriate notice to the certified Class, in compliance with Fed. R. Civ. P. 23(c)(1)(2)(A) and/or (B), to be approved by the Court after class certification, or pursuant to court order under Fed. R. Civ. P. 23(d).

Predominance of Common Issues

469. This action satisfies the requirements of Fed. R. Civ. P. 23(a)(2) and 23(b)(3) because questions of law and fact that have common answers that are the same for the Class predominate over questions affecting only individual Class members.

470. Common issues include, without limitation, the following questions of law and fact for the Class:

- a. Whether the Merger substantially lessened competition in the Retail Order Flow Market.

- b. Whether Defendant violated Section 7 of the Clayton Act.
- c. Whether Defendant's unlawful conduct was a substantial contributing factor in the injury to members of the Class.

Typicality

471. This action satisfies the requirements of Fed. R. Civ. P. 23(a)(3) because for the proposed Class, the identified Plaintiffs' claims are typical of the claims of other Class members and arise from the same course of conduct by Defendant. The relief the Class's named Plaintiffs seek is a typical of the relief sought for the absent Class members.

Adequate Representation

472. Plaintiffs will fairly and adequately represent and protect the interest of the Class. Plaintiffs have retained counsel with substantial experience in prosecuting antitrust and consumer class actions.

473. Plaintiffs and their counsel are committed to vigorously prosecuting this action on behalf of the Class and have the financial resources to do so. Neither Plaintiffs nor their counsel have interests adverse to those of the Class.

Superiority

474. This action satisfies the requirements of Fed. R. Civ. P. 23(b)(2) because Defendant has acted and refused to act on grounds generally applicable to the Class, thereby making appropriate final injunctive and/or corresponding declaratory relief with respect to the Class as a whole.

475. This action satisfies the requirements of Fed. R. Civ. P. 23(b)(3) because a class action is superior to other available methods for the fair and efficient adjudication of this controversy. The common questions of law and fact regarding Defendant's conduct and responsibility predominate over any question affecting only individual Class members.

476. Because the damages suffered by each individual Class member may be relatively smaller than the costs of litigation, the expense and burden of individual litigation would make it very difficult or impossible for individual Class members to redress the wrongs done to each of them individually, such that most or all Class members would have no rational economic interest in individually controlling the prosecution of specific actions, and the burden imposed on the judicial system by individual litigation by even a small fraction of the Class would be enormous, making class adjudication the superior alternative under Fed. R. Civ. P. 23(b)(3)(A) for the proposed Class.

477. The conduct of this action as a class action presents far fewer management difficulties, far better conserves judicial resources and the parties' resources, and far more effectively protects the rights of each Class member than would piecemeal litigation.

478. Compared to the expense, burdens, inconsistencies, economic infeasibility, and inefficiencies of individualized litigation, the challenges of managing this action as a class action are substantially outweighed by the benefits to the legitimate interests of the parties, the court, and the public of class treatment in this Court, making class adjudication superior to other alternatives, under Fed. R. Civ. P. 23(b)(3)(D).

479. Plaintiffs are not aware of any obstacles likely to be encountered in the management of this action that would preclude its maintenance as a class action. Rule 23 provides the Court with authority and flexibility to maximize the efficiencies and benefits of the class mechanism and reduce management challenges.

480. The Court may, on motion of Plaintiffs or on its own determination, certify nationwide, statewide, and/or multistate classes for claims sharing common legal questions; utilize the provision of Rule 23(c)(4) to certify any particular claims, issues, or common questions of fact

or law for class-wide adjudication; certify and adjudicate bellwether class claims; and utilize Rule 23(c)(5) to divide any class into subclasses.

REALLEGATION AND INCORPORATION BY REFERENCE

481. Plaintiffs reallege and incorporate by reference all the preceding paragraphs and allegations of this Complaint, as though fully set forth in each of the following Claim for Relief asserted on behalf of the Class.

CLAIM FOR RELIEF

COUNT I

Section 7 of the Clayton Act

482. The Merger has, had, and will have, the effect of substantially lessening competition and tending to create a monopoly in the relevant market for Retail Order Flow.

483. As alleged in this Complaint, Defendant, including through its subsidiaries and affiliates, continued and/or maintained payment for order flow agreements with market makers and received payments for order flow associated with stock and options trades by Plaintiffs and members of the Class.

484. The Merger was a transaction in interstate commerce, including because it was consummated using the wires, mails, and across state lines.

485. Plaintiffs and the Class have suffered and will suffer injury of the type that the antitrust laws were intended to prevent. Plaintiffs and the Class have been and will be injured by the substantial lessening of competition as a result of the acquisition and integration by Defendant of TD Ameritrade, including, among other injuries sustained, by receiving—through rebate, price improvement, or some combination of both—a lesser amount of the payment for order flow associated with their trades than they would have absent the anticompetitive Merger.

486. Plaintiffs and the Class seek treble damages, attorneys' fees, and costs, to compensate them for the money they would have been paid in connection with their trades with Defendant but for the anticompetitive lessening of payment for order flow remittances as a result of the Merger.

487. Plaintiffs and the Class seek divestiture of TD Ameritrade from the Merged Entity, or in the alternative, segregation of the respective Schwab and TD Ameritrade lines of business within the Merged Entity, to protect against further injury due to the anticompetitive Merger.

488. Plaintiffs and the Class seek an injunction requiring that Defendant allow them to opt out of payment for order flow in their trades with Defendant.

PRAYER FOR RELIEF

WHEREFORE, Plaintiffs pray that this Court:

A. Enter an order certifying this case as a class action pursuant to Federal Rule of Civil Procedure 23;

B. Enter a judgment declaring that Defendants have committed the violations of law alleged in this case;

C. Award actual, compensatory, statutory, consequential damages;

D. Award punitive and treble damages;

E. Award equitable monetary relief, including restitution and disgorgement of all ill-gotten gains, and the imposition of a constructive trust upon, or otherwise restricting the proceeds of Defendant's ill-gotten gains, to ensure an effective remedy;

F. Award Plaintiffs the cost of this action, including reasonable attorneys' fees and expenses and expert fees;

G. Award declaratory relief;

H. Issue an injunction to remedy the effects of the substantial lessening of competition on Plaintiff and the Class, including by divesting the Merged Entity of the acquired TD Ameritrade assets or, in the alternative, requiring segregation of the Schwab and TD Ameritrade lines of business, and by requiring that Plaintiff and the Class Members be permitted to opt-out of payment for order flow for their trades;

I. Award pre-judgment and post-judgment interest at the highest rate allowed by law; and

J. Grant such further relief as this Court may deem just and proper.

JURY DEMAND

Plaintiffs demand a trial by jury on all claims so triable as a matter of right.

Dated: June 2, 2022

Respectfully submitted,

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